Lloyd's Register

Rules and Regulations for the Classification of Naval Ships, January 2009

Notice No. 2

Effective Date of Latest Amendments:

See page 1

Issue date: August 2009

RULES AND REGULATIONS FOR THE CLASSIFICATION OF NAVAL SHIPS, *January 2009*

Notice No. 2

This Notice contains amendments within the following Sections of the *Rules and Regulations for the Classification of Naval Ships, January 2009.* The amendments are effective on the dates shown:

Volume	***Part***	***Chapter***	***Section***	***Effective date***
1	1	2	3	1 January 2010
1	1	2	3	Corrigenda
1	1	3	1,6	1 July 2009
1	3	2	3, 4	1 January 2010
1	3	4	1, 2, 7	1 January 2010
1	4	3	3, 4	1 January 2010
1	6	2	3, 4, 5, 6	1 January 2010
1	6	6	2	1 July 2009
1	6	6	2, 4, 5, 6	1 January 2010
1	6	6	2	Corrigendum
3	1	6	1, 2, 3, 4, 5	1 January 2010
3	3	1	1, 2	1 January 2010
3	3	2	1, 2, 3	1 January 2010
3	3	3	1, 2, 3	1 January 2010
3	3	4	1, 2, 3	1 January 2010

It will be noted that the amendments also include corrigenda, which are effective from the date of this Notice.

The *Rules and Regulations for the Classification of Naval Ships, January 2009* are to be read in conjunction with this Notice No. 2. The status of the Rules is now:

Rules for Naval Ships	Effective date:	January 2009
Notice No. 1	Effective date:	1 April 2009 & Corrigenda
Notice No. 2	Effective dates:	1 July 2009, 1 January 2010 & Corrigenda

Volume 1, Part 1, Chapter 2
Classifications Regulations

CORRIGENDA

■ *Section 3*
Character of Classification and Class notations

3.5 Service area notations

Table 2.3.1 Hull, Military and Other Class Notations (*Part only shown*)

Mandatory Notations		Other Notations		
Ship Type	Service Area	Hull Strength	Military Distinction ✠ MD	Others
See 3.4 (Select one:) **NS1**	*See* 3.5 (Select one:) **SA1** Service Area 1	*See* 3.6 ~~**IB1 IB2**~~ **ESA1 ESA2** Extreme Strength Assessment	*See* 3.7 **IB1 IB2** Internal Air Blast	*See* 3.9 **LAP** Lifting Appliances

Effective date 1 January 2010

■ *Section 3*
Character of Classification and Class notations

3.5 Service area notations

Table 2.3.1 Hull, Military and Other Class Notations (*Part only shown*)

Mandatory Notations		Other Notations		
Ship Type	Service Area	Hull Strength	Military Distinction ✠ MD	Others
Amphibious Assault Ship Amphibious Transport Dock Landing Craft Minehunter Minelayer Mine-sweeper Patrol Ship Survey Ship e.g. NS1 Helicopter Carrier Oil Supply Ship Landing Ship Dock Survey Ship Stores Replenishment Ship Transport Dock Ro-Ro Ship Troop Carrier Vehicle Carrier Air Cushioned Support Vehicle				**SERS** Ship Emergency Response Service **EER** Escape, Emergency Access, Evacuation and Rescue (*see* ~~Note~~ Notes 1 & 2) **FIRE** Fire Protection (*see* ~~Note~~ Notes 1 & 2) **LSAE** Life Saving and Evacuation (*see* ~~Note~~ Notes 1 & 2) **ESC** Escape and Emergency Access (*see* ~~Note~~ Notes 1 & 2) **SNC** Safety of Navigation and Communication (*see* Note 1) **POL** Pollution Prevention

NOTES
1. Star Endorsement (★) may be assigned to this notation where the arrangements on board are in accordance with stated National Administration requirements.
2. Double Star Endorsement (★★) may be assigned to this notation where the arrangements on board are in accordance with the requirements of *ANEP-77 NATO Naval Ship Code* (NSC).

3.9 Other notations

3.9.10 **FIRE Fire Protection**. This notation will be assigned to naval ships which are shown to have levels of fire protection that incorporate the functional requirements and objectives of the applicable IMO International Conventions or *ANEP-77 NATO Naval Ship Code* (NSC) and that have been accepted by LR in accordance with LR's Rules.

3.9.11 **ESC Escape and Emergency Access**. This notation will be assigned to naval ships which demonstrate levels of personnel safety in the event of a 'prepare to evacuate' situation and emergency access arrangements that incorporate the functional requirements and objectives of the applicable IMO International Conventions or *ANEP-77 NATO Naval Ship Code* (NSC) and that have been accepted by LR in accordance with LR's Rules. Where the requirements of the NSC are to be applied for an **ESC ★★** notation, the **LSAE★★** notation must also be applied.

3.9.12 **LSAE Life-saving and Evacuation Arrangements**. This notation will be assigned to naval ships which demonstrate the provision of life-saving and rescue equipment on board that incorporates the functional requirements and objectives of the applicable IMO International Conventions or *ANEP-77 NATO Naval Ship Code* (NSC) and that have been accepted by LR in accordance with LR's Rules. Where the requirements of the NSC are to be applied for an **LSAE★★** notation, the **ESC★★** notation must also be applied.

Volume 1, Part 1, Chapter 3
Periodical Survey Regulations

Effective date 1 July 2009

■ *Section 1* General

1.8 Thickness measurement at surveys

1.8.2 ~~Prior to the commencement of the survey,~~ Further to the requirements of 1.6.6 a survey planning meeting is to be held between the attending Surveyor(s), the Owner/Navy's representative and the thickness measurement firm's representative, so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out onboard.

1.8.3 Thickness measurements are normally to be taken by means of ultrasonic test equipment and are to be carried out by a company ~~qualified as Grade 1 or Grade 2 according to~~ approved in accordance with LR's *Approval for Thickness Measurement of Hull Structures*~~, or by a suitably qualified Surveyor~~.

~~*1.8.4* The degree of supervision or check testing by the Surveyor is dependent upon the grade of approval extended to the company carrying out the thickness measurements:~~

~~(a) The work of companies having Grade 1 approval is subject to check testing by the Surveyor.~~

~~(b) Thickness measurements by companies having Grade 2 approval are to be carried out with the Surveyor substantially in attendance.~~

~~*1.8.5*~~ *1.8.4* The Surveyor may require measuring the thickness of the material in any portion of the structure where signs of wastage are evident or wastage is normally found. Any parts of the structure which are found defective or excessively reduced in scantlings are to be made good by materials of the approved scantlings and quality. Attention is to be given to the structure in way of discontinuities.

1.8.5 Thickness measurements are to be witnessed by the Surveyor. This requires the Surveyor to be on board, while the measurements are carried out, to the extent necessary to control the process. This also applies to thickness measurements carried out while the ship is at sea.

~~*1.8.9* Thickness measurement is normally carried out by approved companies who are required to report their findings to LR.~~

~~*1.8.10*~~ *1.8.9* A report is to be prepared by the approved company carrying out the thickness measurements. The report is to give the location of measurement, the thickness measured as well as the corresponding original thickness. The report is to give the date when measurement was carried out, the type of measuring equipment, names of personnel and their qualifications and is to be signed by the operator ~~and supervisor~~.

~~*1.8.11*~~ *1.8.10* The thickness measurement report is to be verified and signed by the Surveyor and countersigned by an authorising Surveyor.

1.8.11 In all cases the extent of the thickness measurements is to be sufficient to represent the actual average condition.

Volume 1, Part 1, Chapter 3 & Part 3, Chapter 2

■ *Section 6*

Special Survey – Thickness measurement requirements for steel ships

6.2 Thickness measurement reporting

~~*6.2.1* Thickness measurement is normally carried out by approved companies who are required to report their findings to LR as follows.~~

~~*6.2.2*~~ *6.2.1* A report is to be prepared by the approved company carrying out the thickness measurement. The report is to give the location of measurement, the thickness measured as well as the corresponding original thickness. The report is to give the date when the measurement was carried out, the type of measuring equipment, names of personnel and their qualifications and is to be signed by the operator ~~and supervisor~~.

~~*6.2.3*~~ *6.2.2* The thickness measurement report is to be verified and signed by the Surveyor, and included with the Surveyor's report.

Volume 1, Part 3, Chapter 2

Ship Design

Effective date 1 January 2010

■ *Section 3*

Main hull structure

3.7 Deck structure

3.7.21 Pipe or cable runs through watertight decks are to be fitted with suitable watertight glands of a type, approved and pressure tested for the maximum head of water indicated by any required damage stability calculations.

3.7.22 The Naval Authority may require type approval of all watertight deck penetration glands to a nominated standard.

~~*3.7.22*~~ *3.7.23* Doors and hatches fitted in watertight decks are to be of equivalent construction to the deck in which they are fitted, be permanently attached and capable of being closed watertight from both sides of the deck except for access to high security areas such as magazines or to prevent access from open decks as agreed with the Naval Authority. They are to be tested watertight in accordance with the LR survey procedures.

■ *Section 4*

Bulkhead arrangements

4.1 General

4.1.6 Pipe or cable runs through watertight bulkheads are to be fitted with suitable watertight glands of a type, approved and pressure tested for the maximum head of water indicated by any required damage stability calculations.

4.1.7 The Naval Authority may require type approval of all watertight bulkhead penetration glands to a nominated standard.

~~*4.1.7*~~ *4.1.8* Partial or main bulkheads are to be located beneath the ends of superstructures and deckhouses and masts and heavy items of equipment such as weapon systems to support and transmit the static and dynamic forces into the hull structure. They are to be of sufficient strength and rigidity to carry the concentrated loads imposed on them and maintain alignment where necessary.

4.7 Watertight doors and hatches in ~~bulkheads~~ watertight subdivision boundaries below the vertical extent of watertight~~ness~~ integrity

4.7.1 Watertight doors and hatches are to be ~~efficiently~~ constructed under survey and ~~fitted,~~ surveyed during installation. ~~and~~ Doors are to be capable of being operated when the ship is listed up to 15° either way. ~~They~~ Doors and hatches are to be operated under working conditions and ~~hose~~ tested in place, *see* Pt 6, ~~Ch 3~~ Ch 6.

4.7.3 Where the doors and hatches are fitted in watertight ~~bulkheads~~ subdivision boundaries they are to be of equivalent strength to the unpierced ~~bulkhead~~ division and capable of being closed watertight. Watertight doors and hatches are to be of a type, approved and pressure tested from both sides for the maximum head of water indicated by any required damage stability calculations.

4.7.4 Indicators are to be provided on the bridge, ship command centre or operations room showing whether the doors and hatches are open or closed.

4.7.5 Doors and hatches are to be capable of being operated from both sides of the ~~bulkhead~~ watertight division and from an accessible position above the vertical limit of watertight integrity. Power operated sliding doors are to be capable of being opened and closed locally by both power and efficient hand operated mechanisms.

~~*4.7.6* Doors not required to be used at sea may be of the hinged or sliding type. A notice is to be fixed on the closing appliance saying it should be kept closed at all times while the ship is at sea.~~

~~*4.7.7*~~ *4.7.6* Watertight doors which are intended to be used while at sea are to be of the sliding type capable of being remotely closed from the bridge. An audible alarm is to be provided at the door closure. The power, control and indicators are to be operable in the event of main power failure. Particular care is to be paid to minimising the effect of control system failure.

~~*4.7.8*~~ *4.7.7* As an alternative to the sliding doors required by ~~4.7.7~~ 4.7.6, special consideration will be given to the fitting of hinged watertight doors where it can be shown that they are as effective as the sliding type. A suitable ~~log-book~~ system is to be operated to ensure that such doors remain closed ~~except when in use for access~~ when operating at an increased risk of collision or grounding.

~~*4.7.9*~~ *4.7.8* ~~Subject to the requirements of 4.7.7 and 4.7.8, hinged~~ Hinged weathertight doors ~~of approved pattern~~ may be fitted above the ~~damage control deck to provide access~~ vertical limit of watertight integrity. Doors are to be manufactured in accordance with a National Standard and tested following installation, *see* Pt 6, Ch 6.

~~*4.7.10* Each watertight door is to be subject to a pressure test, *see* Pt 6, Ch 3. The test may be carried out either before or after the door is fitted.~~

Volume 1, Part 3, Chapter 4
Closing Arrangements and Outfit

Effective date 1 January 2010

■ *Section 1*
Introduction

1.1 General

1.1.3 Provisions covering acceptable arrangements for the watertight and weathertight integrity of the hull and spaces within the hull are to be read in conjunction with the limits defined in Pt 3, Ch 1,1.3. For watertight doors and hatches in watertight subdivision boundaries below the vertical extent of watertight integrity, *see* Ch 2,4.7.

■ *Section 2*
Hatches and miscellaneous openings on the weather deck

2.3 Manholes and flush escape hatches

2.3.2 Flush escape hatches are to be closed by substantial weathertight covers capable of being opened and closed from either side except for access to high security areas such as magazines or to prevent access from open decks as agreed with the Naval Authority. The covers are to be permanently attached.

■ *Section 7*
Scuppers and sanitary discharges

7.1 General

~~*7.1.3* Scuppers and discharges which drain spaces below the weather deck, or spaces within intact superstructures or deckhouses on the weather deck, fitted with efficient weathertight doors, are to be led overboard in the case of scuppers, or to suitable sanitary tanks in the case of sanitary discharges. Alternatively, they may be led overboard provided that:~~

~~(a) When at the design draught, the deck edge is not immersed when the ship heels to 5°; and~~

~~(b) the scuppers are fitted with means of preventing water from passing inboard in accordance with 7.2.~~

7.1.3 Where the freeboard is such that the deck edge forming the vertical limit of watertight integrity is immersed when the ship heels 5° or less, scuppers and discharges which drain spaces below this deck, or spaces within intact superstructures or deckhouses on this deck fitted with efficient weathertight doors, may be led to the bilges in the case of scuppers or to suitable sanitary tanks in the case of sanitary discharges. Where the freeboard is such that the deck edge forming the vertical limit of watertight integrity is immersed when the ship heels greater than 5° then they are to be led overboard and fitted with means of preventing water from passing inboard in accordance with 7.2.

7.2 Closing appliances

7.2.6 Scuppers and discharge pipes originating at any level which penetrate the shell either more than 450 mm below the ~~weather~~ deck forming the vertical limit of watertight integrity or less than 600 mm above the ~~design~~ deep draught waterline, are to be fitted with an automatic non-return valve at the shell. This valve, unless required by 7.1.3, may be omitted provided the piping has a minimum wall thickness of:

- 7,0 mm for pipes of 80 mm external diameter or smaller.
- 10,0 mm for pipes of 180 mm external diameter.
- 12,5 mm for pipes of 220 mm external diameter or greater.

Intermediate minimum thicknesses are to be determined by linear interpolation. Unless required by 7.1.8, the maximum thickness need not exceed 12,5 mm.

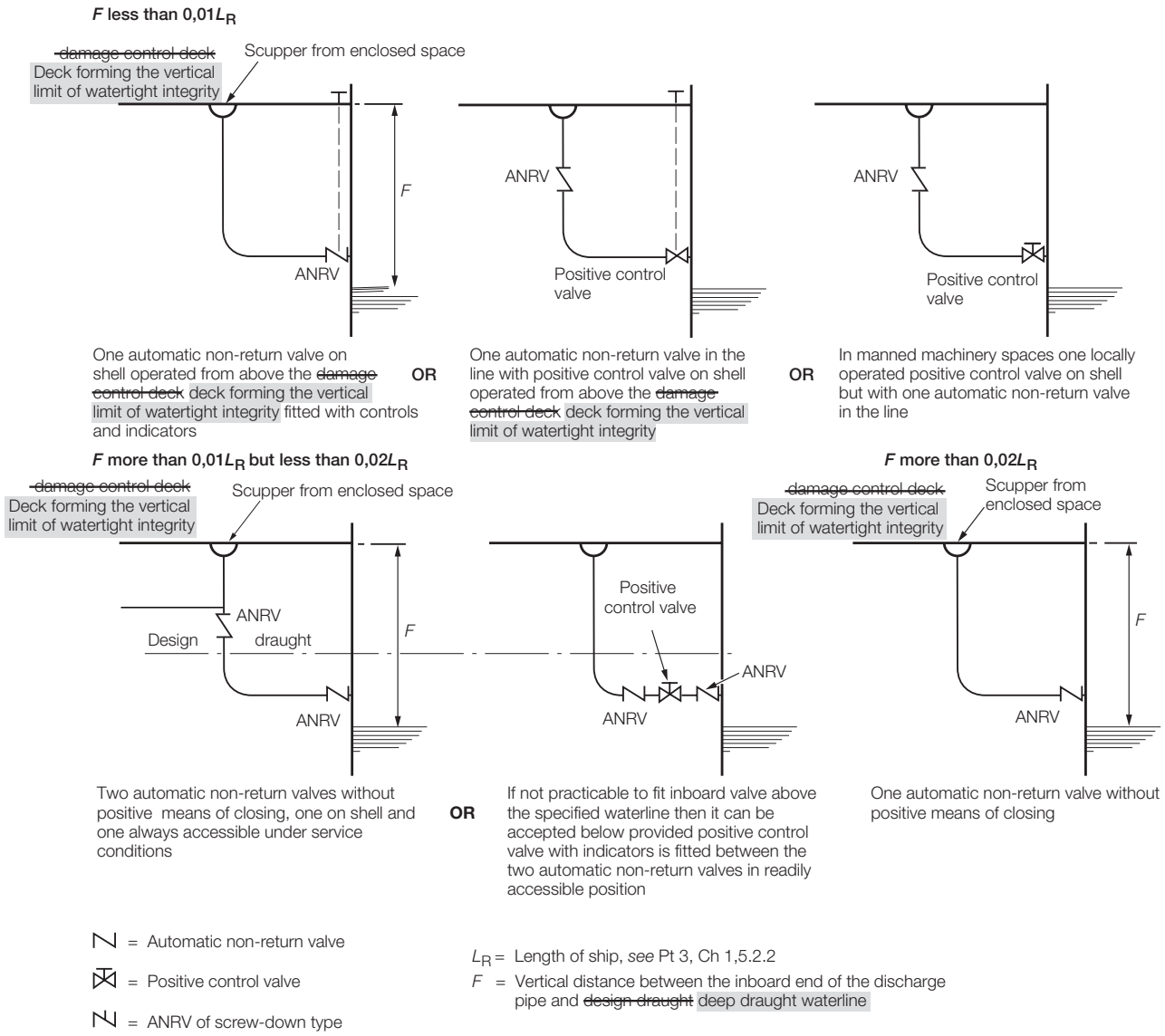

Fig. 4.7.1 Diagrammatic arrangement of discharge valves

Volume 1, Part 4, Chapter 3
Special Features

Effective date 1 January 2010

■ *Section 3*
Bow doors

3.4 Construction and testing

3.4.1 Plans are to be of sufficient detail for plan approval purposes. Plans showing the proposed scantlings and arrangement of the bow door are to be submitted. Bow doors are to be constructed under survey.

3.4.2 Bow doors fitted below the limit of watertight integrity are to be subject to a pressure test of a prototype to confirm the design pressure head.

3.4.3 As an alternative to prototype testing, the integrity of the door may be demonstrated by calculation and representative testing in accordance with IMO MSC/Circular 1176 – *Unified Interpretations to SOLAS Chapters II-1 and XII and to the Technical Provisions for Means of Access for Inspections*. For doors fitted above the vertical limit of watertight integrity, the doors only require testing following installation, in accordance with Table 6.6.1 in Pt 6, Ch 6.

Existing sub-Sections 3.4 *to* 3.10 *are to be renumbered* 3.5 to 3.11.

■ *Section 4*
Side, stern doors and other shell openings

4.3 Construction and testing

4.3.1 Plans are to be of sufficient detail for plan approval purposes. Plans showing the proposed scantlings and arrangements of any side and stern doors or other shell openings are to be submitted. Side and stern doors or other shell openings are to be constructed under survey.

4.3.2 Side and stern doors fitted below the limit of watertight integrity are to be subject to a pressure test of a prototype to confirm the design pressure head.

4.3.3 As an alternative to prototype testing, the integrity of the door may be demonstrated by calculation and representative testing in accordance with IMO MSC/Circular 1176 – *Unified Interpretations to SOLAS Chapters II-1 and XII and to the Technical Provisions for Means of Access for Inspections*. For doors fitted above the vertical limit of watertight integrity, the doors only require testing following installation, in accordance with Table 6.6.1 in Pt 6, Ch 6.

Existing sub-Sections 4.3 *to* 4.10 *are to be renumbered* 4.4 to 4.11.

Volume 1, Part 6, Chapter 2
Design Tools

Effective date 1 January 2010

■ ~~*Section 3*~~
~~Detail design~~

~~3.1 Secondary member end connections~~

~~*3.1.1* Secondary members, that is longitudinals, beams, frames and bulkhead stiffeners forming part of the hull structure, are to be effectively continuous and are to be suitably bracketed at their end connections. Where it is desired to adopt bracketless connections, the proposed arrangements will be individually considered, *see also* Ch 6,5 and Table 6.4.3.~~

~~*3.1.2* Where bracketed end connections are fitted in accordance with these requirements, they may be taken into account in determining the effective span of the member.~~

~~*3.1.3* The scantlings of secondary member end connections are to be in accordance with 3.2.~~

~~3.2 Scantlings of end brackets~~

~~*3.2.1* For a naval ship, longitudinal strength members are to be continuous through primary supports. In exceptional cases for ships having a military distinction notation **MD** and in areas not subject to significant fatigue loading, longitudinal strength members may be cut at a primary support and the continuity of strength is to be provided by brackets. In such cases the scantlings of the brackets are to be such that their section modulus and effective cross-sectional area are not less than those of the member. Care is to be taken to ensure correct alignment of the brackets on each side of the primary member.~~

~~*3.2.2* In other cases the scantlings of the bracket are to be based on the modulus as follows:~~

~~(a) Bracket connecting stiffener to primary member – modulus of the stiffener.~~

~~(b) Bracket at the head of a main transverse frame where frame terminates – modulus of the frame.~~

~~(c) Brackets connecting lower deck beams or longitudinals to the main frame in the forward $0{,}5L_R$ – modulus of the frame.~~

(d) Elsewhere – the lesser modulus of the members being connected by the bracket.

3.2.3 The web thickness and face flat area of end brackets are not in general to be less than those of the connecting stiffeners. Additionally, the stiffener proportion requirements of 2.9 are to be satisfied.

3.2.4 Typical arrangements of stiffener end brackets are shown diagrammatically in Fig. 2.3.1.

3.2.5 The lengths, d_a and b_a, of the arms are to be measured from the plating to the toe of the bracket and are to be such that:

(a) $d_a + b_a \geq 2{,}0 l_b$

(b) $d_a \geq 0{,}8 l_b$

(c) $b_a \geq 0{,}8 l_b$

where a and b are the actual lengths of the two arms of the bracket, in mm, measured from the plating to the toe of the bracket

$$l_b = 90\left(2\wedge\sqrt{\frac{Z}{14+\sqrt{Z}}} - 1\right) \text{mm}$$

Z = the section modulus of the secondary member, in cm^3

In no case is l_b to be taken as less than twice the web depth of the stiffener on which the bracket scantlings are to be based.

3.2.6 The scantlings of deep web frames are based on the inclusion of the standard brackets specified in 3.2.5 at top and bottom, while the scantlings of side frames are normally to be based on a standard bracket at the top only. Where the actual arm lengths fitted, d_{a1}, and b_{a1}, (in mm) are smaller than Rule size above or the bracket is omitted then, for comparison purposes, an equivalent arm length, l_a, is to be derived from:

(a) $l_a = \dfrac{(d_{a1} + b_{a1})}{2}$

(b) $d_{a1} \geq 0{,}8 l_a$

(c) $b_{a1} \geq 0{,}8 l_a$

(d) $l_a = 0$, where:

(i) bracket is omitted from the upper or lower ends of the frame, or

(ii) lower frame bracket at bilge is at same level as the inner bottom, or

(iii) lower frame is welded directly to the inner bottom.

3.2.7 The free edge of the bracket is to be stiffened where any of the following apply:

(a) The section modulus, Z, exceeds 2000 cm^3.

(b) The length of free edge exceeds 50 times the bracket thickness.

(c) The bracket is fitted at the lower end of main transverse side framing.

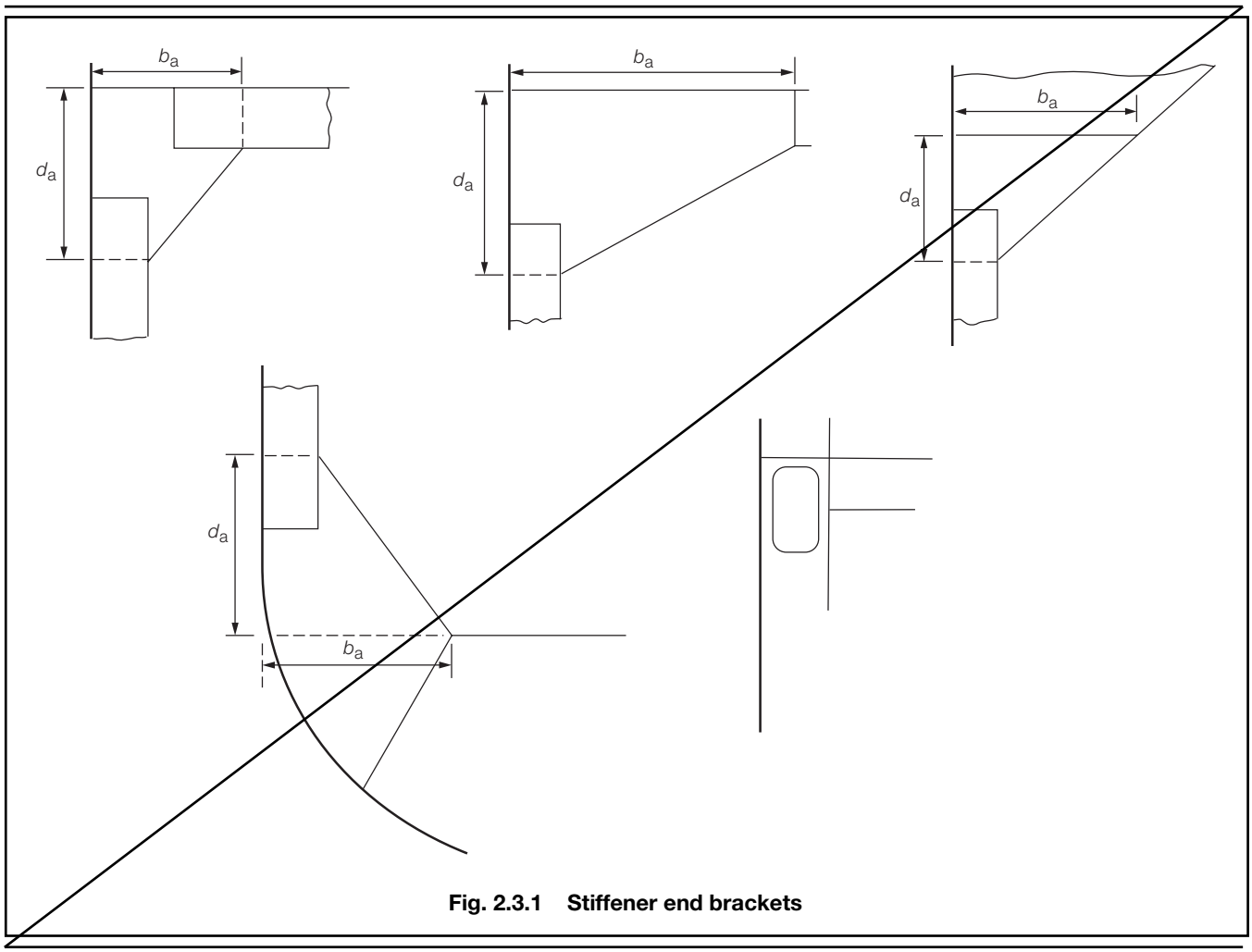

Fig. 2.3.1 Stiffener end brackets

Table 2.3.1 Thickness of end brackets

Bracket	Thickness, in mm	Limits	
		Minimum, in mm	Maximum, in mm
With edge stiffened:			
(a) in dry spaces	$3,5 + 0,25\sqrt{Z}$	6,5	12,5
(b) in deep tanks	$4,5 + 0,25\sqrt{Z}$	7,5	13,5
Unstiffened brackets:			
(a) in dry spaces	$5,5 + \left(\frac{Z}{55}\right) - \left(\frac{Z}{168}\right)^{1/3}$	7,5	
(b) in deep tanks	$6,5 + \left(\frac{Z}{55}\right) - \left(\frac{Z}{168}\right)^{1/3}$	8,5	

3.2.8 Where a face flat is fitted, its breadth, b_f, is to be not less than:

$$b_f = 40\left(1 + \frac{Z}{1000}\right) \text{ mm but not less than 50 mm.}$$

3.2.9 Where the edge is stiffened by a welded face flat, the cross-sectional area of the face flat is to be not less than:
(a) $0,009k_e b_f t_b$ cm^2 for offset edge stiffening.
(b) $0,014k_e b_f t_b$ cm^2 for symmetrically placed stiffening.
b_f = breadth of face flat, in mm
t_b = the thickness of the bracket, in mm
k_e is as defined in 1.3.1.

3.2.10 Where the stiffening member is lapped on to the bracket, the length of overlap is to be adequate to provide for the required area of welding. In general, the length of overlap is not to be less than $10\sqrt{Z}$ mm, or the depth of stiffener, whichever is the greater.

3.2.11 Where the free edge of the bracket is hollowed out, it is to be stiffened or increased in size to ensure that the modulus of the bracket through the throat is not less than that of the required straight edged bracket.

3.2.12 The arrangement of the connection between the stiffener and the bracket is to be such that at no point in the connection is the actual modulus reduced to less than that of the stiffener with associated plating.

3.2.13 The design of end connections and their supporting structure is to be such as to provide adequate resistance to rotation and displacement of the joint.

3.2.14 The thickness of the bracket is to be not less than as required by Table 2.3.1.

Existing Sections 4 *to* 6 *are to be renumbered* Sections 3 *to* 5.

Volume 1, Part 6, Chapter 6
Material and Welding Requirements

Effective date 1 January 2010

■ *Section 2* Materials

2.4 Ships operating in cold weather conditions

2.4.1 Unless otherwise specified, all ships designed for sea area SA1 and other ships intended to operate for extended periods in cold weather conditions, the minimum toughness requirements for the material of the hull structure are specified in Fig. 6.2.2 and Table 6.2.5. The requirements are based on a design air temperature of -30°C. Where an alternative design air temperature is required, the materials selected are to be in accordance with Pt 3, Ch 2,3 of the *Rules and Regulations for the Classification of Ships* (hereinafter referred to as the Rules for Ships). In the absence of specific information, the air temperature should be taken as:

- for Ice class 1C first year strengthened ships not higher than –30°C,
- for Ice class 1AS, 1A and 1B first year ice strengthened ships not higher than –40°,
- for multi year ice strengthened ice breaking ships not higher than –50°.

In all cases the water temperature should not be taken higher than –10°C.

CORRIGENDUM

2.5 Mechanical properties for design

2.5.1 The scantlings determined within this Part of the Rules assume that mild steel has the following mechanical properties:

	N/mm^2
Yield strength (minimum)	235
Tensile strength	400–490
Modulus of elasticity	~~200 x 103~~ 200 x 10^3

Effective date 1 July 2009

~~Table 6.2.1 Material classes and grades~~

Structural member category	Within $0{,}3L_R$ to $0{,}7L_R$	Outside $0{,}3L_R$ to $0{,}7L_R$
SECONDARY: • Lower strake in longitudinal bulkhead • Deck plating exposed to weather, in general • Side plating	I	0
PRIMARY: • Bottom plating, including keel plate • Strength deck plating, *see* Note 1 • Continuous longitudinal members above strength deck • Upper strake in longitudinal bulkhead	II	0
SPECIAL: • Sheerstrake or rounded gunwale, *see* Note 3 • Stringer plate at strength deck, *see* Note 3 • Deck strake at longitudinal bulkhead, *see* Note 4 • Bilge strake, *see* Notes 5 and 6	III III	II, in general I, outside $0{,}2L_R$ to $0{,}8L_R$

NOTES

1. Plating at corners of large hatch openings is to be of Class III within $0{,}5L_R$ amidships and Class I elsewhere.
2. Corner insets in way of any complex openings such as for lifts and side doors which may impinge on the deck plating or stringer plate, are to be of Grade D/DH for $t \leq 20$ mm and Grade E/EH for $t > 20$ mm.
3. In ships with length exceeding 250 m, sheerstrake or rounded gunwale and stringer plate at strength deck are not to be less than Grade E/EH within $0{,}3L_R$ to $0{,}7L_R$.
4. In ships with breadth exceeding 70 m, at least three deck strakes in board of the sheerstrake or rounded gunwale, including the stringer plate at the strength deck, are to be of Class III within $0{,}3L_R$ to $0{,}7L_R$.
5. In ships with a double bottom over the full breadth and with length less than 150 m, bilge strake may be of Class II within $0{,}3L_R$ to $0{,}7L_R$.
6. In ships with length exceeding 250 m, bilge strake is not to be less than Grade D/DH over its entire length.
7. For strength members not mentioned, Grade A may generally be used.
8. Within $0{,}3L_R$ to $0{,}7L_R$, single strakes required to be of Class III or of Grade E/EH are to have breadths not less than $800 + 5L_R$ mm, but need not be greater than 1800 mm.
9. The material class used for reinforcement and the quality of material (i.e. whether mild or higher tensile steel) used for welded attachments, such as waterway bars and bilge keels, is to be similar to that of the hull envelope plating in way. Where attachments are made to rounded gunwale plates, special consideration will be given to the required grade of steel, taking account of the intended structural arrangements and attachment details.
10. The material class for deck plating, sheerstrake and upper strake of longitudinal bulkhead within $0{,}3L_R$ to $0{,}7L_R$ is also to be applied at structural breaks in the superstructure regardless of position.
11. Engine seat top plates outside $0{,}2L_R$ to $0{,}8L_R$ may be Grade A/AH. Steel grade requirement for top plates within $0{,}2L_R$ to $0{,}8L_R$ will be specially considered.
12. Steel grade is to correspond to the as-fitted thickness.
13. Plating materials for sternframes, rudders, rudder horns and shaft brackets are, in general, not to be of lower Grades than corresponding to Class II. For rudder and rudder body plates subjected to stress concentrations (e.g. in way of lower support of semi-spade rudders or at upper part of spade rudders) Class III is to be applied.
14. Steel grade in way of bilge keels is to comply with the requirements of Ch 6,5.9.
15. RAS seating and support structure are to be of Grade D/DH for $t \leq 20$ mm and Grade E/EH for $t > 20$ mm. For ships operating in cold weather RAS seating and support structure are to be of grade E/EH.

Table 6.2.1 Material classes and grades

Structural member category	Material class/grade
SECONDARY	
A1. Longitudinal bulkhead strakes, other than belonging to the Primary category A2. Deck plating exposed to weather, other than that belonging to the Primary or Special category A3. Side plating	Class I within 0,4*L* amidships Grade A/AH outside 0,4*L* amidships
PRIMARY	
B1. Bottom plating, including keel plate B2. Strength deck plating, excluding that belonging to the Special category, *see* Note 7 B3. Continuous longitudinal members above strength deck B4. Uppermost strake in longitudinal bulkhead	Class II within 0,4*L* amidships Grade A/AH outside 0,4*L* amidships
SPECIAL	
C1. Sheer strake (or rounded gunwale) and stringer plate at strength deck, *see* Note 1 C2. Deck strake at longitudinal bulkhead, *see* Note 1	Class III within 0,4*L* amidships Class II outside 0,4*L* amidships Class I outside 0,6*L* amidships
C3. Strength deck plating at corners of cargo hatch openings in bulk carriers, *see* 1.1.3, ore carriers, combination carriers and other ships with similar hatch opening configurations	Class III within 0,4*L* amidships Class II within rest of cargo region
C4. Bilge strake in ships with double bottom over the full breadth and length less than 150 m, *see* Note 1	Class II within 0,6*L* amidships Class I outside 0,6*L* amidships
C5. Bilge strake in other ships, *see* Note 1	Class III within 0,4*L* amidships Class II outside 0,4*L* amidships Class I outside 0,6*L* amidships
SHIPS WITH LENGTH EXCEEDING 150 m AND SINGLE STRENGTH DECK	
D1. Longitudinal strength members of strength deck plating	Grade B/AH within 0,4*L* amidships
D2. Continuous longitudinal strength members above strength deck	Grade B/AH within 0,4*L* amidships
D3. Single side strakes for ships without inner continuous longitudinal bulkhead(s) between bottom and strength deck	Grade B/AH within cargo region
SHIPS WITH LENGTH EXCEEDING 250 m	
E1. Sheer strake (or rounded gunwale) and stringer plate at strength deck, *see* Note 1	Grade E/EH within 0,4*L* amidships
E2. Bilge strake, *see* Note 1	Grade D/DH over its entire length

NOTES

1. Single strakes required to be of Class III or of Grade E/EH and within 0,4*L* amidships are to have breadths not less than 800 + 5*L* mm, but need not be greater than 1800 mm, unless limited by the geometry of the ship's design.
2. In ships with breadth exceeding 70 m, at least three deck strakes in board of the sheerstrake or rounded gunwale, including the stringer plate at the strength deck, are to be of Class III within $0,3L_R$ to $0,7L_R$.
3. In ships with a double bottom over the full breadth and with length less than 150 m, bilge strake may be of Class II within $0,3L_R$ to $0,7L_R$.
4. For strength members not mentioned, Grade A/AH may be generally used.
5. Steel grade is to correspond to the as-fitted thickness.
6. Plating materials for sternframes, rudders, rudder horns and shaft brackets are, in general, not to be of lower grades than corresponding to Class II. For rudder and rudder body plates subjected to stress concentrations (e.g. in way of lower support of semi-spade rudders or at upper part of spade rudders) Class III is to be applied.
7. Plating at corners of large hatch openings is to be of Class III within $0,5L_R$ amidships and Class I elsewhere.
8. RAS seating and support structure are to be of Grade D/DH for $t \leq 20$ mm and Grade E/EH for $t > 20$ mm. For ships operating in cold weather RAS seating and support structure are to be of Grade E/EH.
9. Corner inserts in way of complex openings such as for lifts and side doors which may impinge on the deck plating or stringer plate are to be of Grade D/DH for $t \leq 20$ mm and Grade E/EH for $t > 20$ mm.
10. The material class used for reinforcement and the quality of material (i.e. whether mild or higher tensile steel) used for welded attachments, such as waterway bars and bilge keels, is to be similar to that of the hull envelope plating in way. Where attachments are made to rounded gunwale plates, special consideration will be given to the required grade of steel, taking account of the intended structural arrangements and attachment details.
11. The material class for deck plating, sheer strake and upper strake of longitudinal bulkhead within 0,4*L* amidships is also to be applied at structural breaks of the superstructure, irrespective of position.
12. Engine seat top plates outside 0,6*L* amidships may be Grade A/AH. Steel grade requirement for top plates within 0,6*L* amidships will be specially considered.

Effective date 1 January 2010

■ *Section 4*
Welded joints and connections

4.8 Double continuous fillet welding

(*Part only shown*)

4.8.2 Double continuous fillet welding is to be adopted in the following locations and may be used elsewhere if desired:

(l) Forward tanks.

(m) Lap welds in tanks.

(n) Primary and secondary members to bottom shell forward of 0,7*L*.

(o) Where 4.5.5 applies.

(p) Other connections or attachments, where necessary, in particular minor items to high tensile steel plating.

~~(q) Fillet welds where high tensile steel is used.~~

4.9 Intermittent and single sided fillet welding ~~(staggered and chain)~~

4.9.1 The requirements for intermittent fillet welding (staggered and chain) are given in Fig. 6.4.1.

4.9.2 As an alternative to intermittent welding, single sided welding may be used. Only mechanised single sided welding is acceptable.

4.9.3 Where staggered intermittent or single sided fillet welding is used, the welding is to be made continuous round the ends of brackets, lugs, scallops, etc.

~~*4.9.2*~~ *4.9.4* Staggered intermittent or single sided fillet welding is not to be used in the bottom shell structure of high speed ships.

~~*4.9.3*~~ *4.9.5* Chain intermittent welding may be used, outside of the impact area in the bottom shell structure of high speed ships.

~~*4.9.4*~~ *4.9.6* Scalloped construction, ~~or~~ intermittent or single sided fillet welding is not be used in structure on or below the strength deck of ships with shock enhancement or in structure strengthened for blast enhancement, *see* Pt 4, Ch 2.

~~*4.9.5*~~ *4.9.7* ~~Intermittent welding or scalloped~~ Scalloped construction, intermittent or single sided fillet welding is not to be used in structure complying with the requirements of the internal blast station.

~~*4.9.6*~~ *4.9.8* For ships with a shock enhanced notation, the extent of intermittent or single sided fillet welding will be specially considered on the basis of the threat levels

■ *Section 5*
Construction details

5.3 Secondary member end connections

5.3.1 Secondary members, that is longitudinals, beams, frames and bulkhead stiffeners forming part of the hull structure, are to be effectively continuous and are to be suitably bracketed at their end connections. Where it is desired to adopt bracketless connections, the proposed arrangements will be individually considered, *see also* Table 6.4.3.

5.3.2 Where bracketed end connections are fitted in accordance with these requirements, they may be taken into account in determining the effective span of the member.

5.3.3 The scantlings of secondary member end connections are to be in accordance with 5.4.

5.4 Scantlings of end brackets

5.4.1 For a naval ship, longitudinal strength members are to be continuous through primary supports. In exceptional cases for ships having a military distinction notation **MD** and in areas not subject to significant fatigue loading, longitudinal strength members may be cut at a primary support and the continuity of strength is to be provided by brackets. In such cases the scantlings of the brackets are to be such that their section modulus and effective cross-sectional area are not less than those of the member. Care is to be taken to ensure correct alignment of the brackets on each side of the primary member.

5.4.2 In other cases the scantlings of the bracket are to be based on the modulus as follows:

(a) Bracket connecting stiffener to primary member – modulus of the stiffener.

(b) Bracket at the head of a main transverse frame where frame terminates – modulus of the frame.

(c) Brackets connecting lower deck beams or longitudinals to the main frame in the forward $0{,}5L_R$ – modulus of the frame.

(d) Elsewhere – the lesser modulus of the members being connected by the bracket.

5.4.3 The web thickness and face flat area of end brackets are not in general to be less than those of the connecting stiffeners. Additionally, the stiffener proportion requirements of Ch 2,2.9 are to be satisfied.

5.4.4 Typical arrangements of stiffener end brackets are shown diagrammatically in Fig. 6.5.3.

5.4.5 The lengths, d_a and b_a, of the arms are to be measured from the plating to the toe of the bracket and are to be such that:

(a) $d_a + b_a \geq 2{,}0l_b$

(b) $d_a \geq 0{,}8l_b$

c) $b_a \geq 0{,}8l_b$

where

a and *b* are the actual lengths of the two arms of the bracket, in mm, measured from the plating to the toe of the bracket

$$l_b = 90\left(2\sqrt{\frac{Z}{14+\sqrt{Z}}} - 1\right) \text{ mm}$$

Z = the section modulus of the secondary member, in cm^3. In no case is l_b to be taken as less than twice the web depth of the stiffener on which the bracket scantlings are to be based.

5.4.6 The scantlings of deep web frames are based on the inclusion of the standard brackets specified in 5.4.5 at top and bottom, while the scantlings of side frames are normally to be based on a standard bracket at the top only. Where the actual arm lengths fitted, d_{a1}, and b_{a1} (in mm) are smaller than Rule size above or the bracket is omitted then, for comparison purposes, an equivalent arm length, l_a, is to be derived from:

(a) $l_a = \dfrac{(d_{a1} + b_{a1})}{2}$

(b) $d_{a1} \geq 0{,}8l_a$

(c) $b_{a1} \geq 0{,}8l_a$

(d) $l_a = 0$

where

(i) bracket is omitted from the upper or lower ends of the frame, or

(ii) lower frame bracket at bilge is at same level as the inner bottom, or

(iii) lower frame is welded directly to the inner bottom.

5.4.7 The free edge of the bracket is to be stiffened where any of the following apply:

(a) The section modulus, Z, exceeds 2000 cm^3.

(b) The length of free edge exceeds 50 times the bracket thickness.

(c) The bracket is fitted at the lower end of main transverse side framing.

5.4.8 Where a face flat is fitted, its breadth, b_f, is to be not less than:

$$b_f = 40\left(1 + \frac{Z}{1000}\right) \text{ mm but not less than 50 mm.}$$

5.4.9 Where the edge is stiffened by a welded face flat, the cross-sectional area of the face flat is to be not less than:

(a) $0{,}009k_s\, b_f\, t_b$ cm^2 for offset edge stiffening.

(b) $0{,}014k_s\, b_f\, t_b$ cm^2 for symmetrically placed stiffening.

b_f = breadth of face flat, in mm

t_b = the thickness of the bracket, in mm k_s is as defined in Ch 2,1.3.1.

5.4.10 Where the stiffening member is lapped on to the bracket, the length of overlap is to be adequate to provide for the required area of welding. In general, the length of overlap is not to be less than $10\sqrt{Z}$ mm, or the depth of stiffener, whichever is the greater.

5.4.11 Where the free edge of the bracket is hollowed out, it is to be stiffened or increased in size to ensure that the modulus of the bracket through the throat is not less than that of the required straight edged bracket.

5.4.12 The arrangement of the connection between the stiffener and the bracket is to be such that at no point in the connection is the actual modulus reduced to less than that of the stiffener with associated plating.

5.4.13 The design of end connections and their supporting structure is to be such as to provide adequate resistance to rotation and displacement of the joint.

5.4.14 The thickness of the bracket is to be not less than as required by Table 6.5.2.

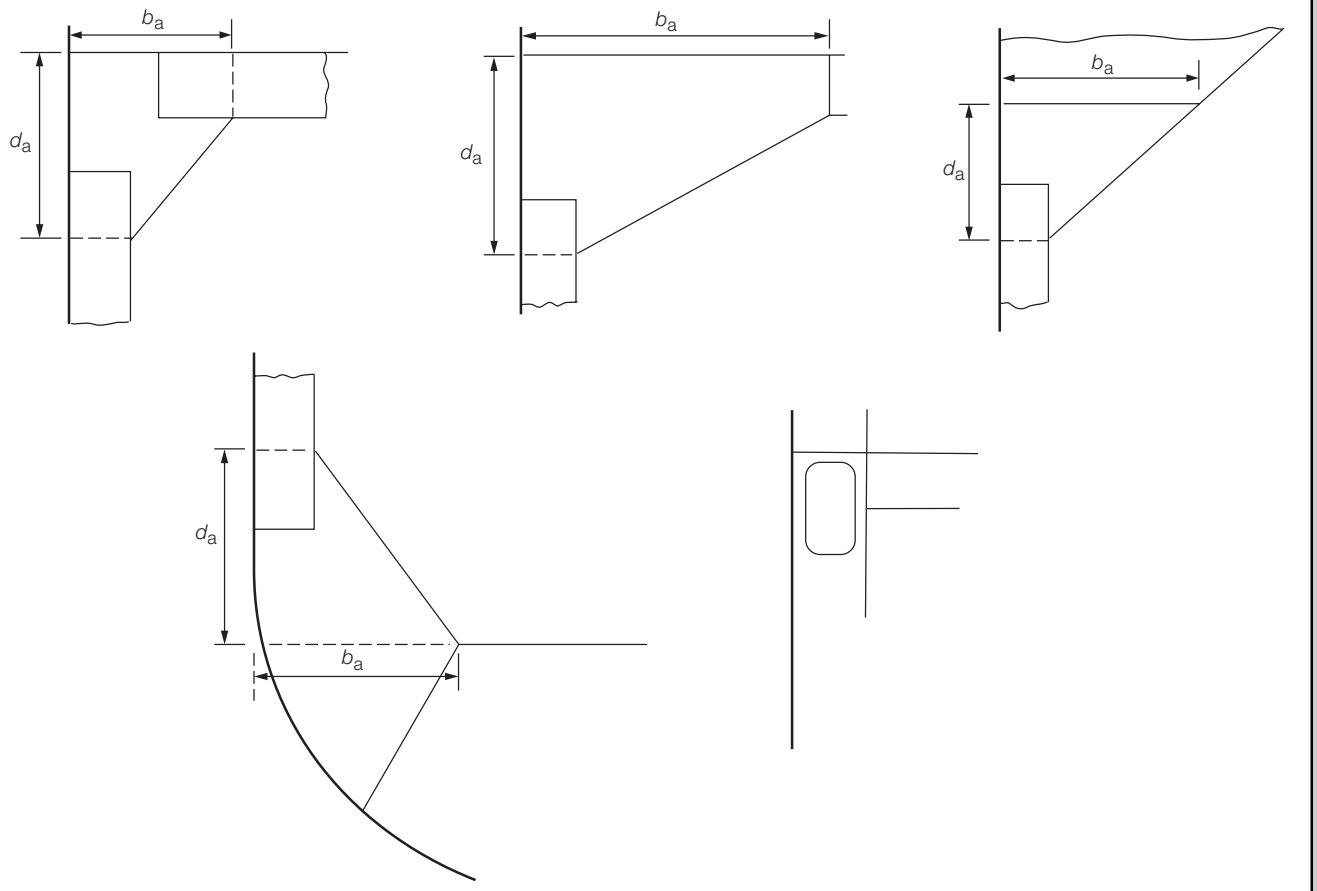

Fig. 6.5.3 Stiffener end brackets

Table 6.5.2 Thickness of end brackets

Bracket	Thickness, in mm	Limits	
		Minimum, in mm	Maximum, in mm
With edge stiffened:			
(a) in dry spaces	$3,5 + 0,25\sqrt{Z}$	6,5	12,5
(b) in deep tanks	$4,5 + 0,25\sqrt{Z}$	7,5	13,5
Unstiffened brackets:			
(a) in dry spaces	$5,5 + \left(\frac{Z}{55}\right) - \left(\frac{Z}{168}\right)^{1/3}$	7,5	
(b) in deep tanks	$6,5 + \left(\frac{Z}{55}\right) - \left(\frac{Z}{168}\right)^{1/3}$	8,5	

Existing sub-Sections 5.3 *to* 5.14 *are to be renumbered* 5.5 *to* 5.16.

■ *Section 6*
Inspection and testing procedures

6.1 General

Table 6.6.1 Testing requirements (*Part only shown*)

Item to be tested	Testing procedure	~~Testing~~ Installation testing requirement
Double plate bilge keels	Structural (1)	— head of water up to the design waterline
Watertight bulkheads, shaft tunnels, flats and recesses, etc.	Hose (2)	*see* 6.6
Watertight doors, ~~and~~ hatches and closing appliances (below the vertical limit of watertight integrity) when fitted in place	Hose (6) and (7)	
Weathertight hatch covers, doors and closing appliances (above the vertical limit of watertight integrity)	Hose	
Fore peak not used as tank	Hose (2)	
~~Shell doors~~	~~Hose~~	
Chain locker, if aft of collision bulkhead	Structural	— head of water up to the top of the overflow pipe
Independent/Separate fuel oil tanks Filling trunks	Structural	— head of water representing the maximum pressure which could be experienced in service for which elastic design criteria were used, but not less than 3,5 m
After peak not used as tank	Leak	*see* 6.5
Magazines	Leak (6) and (~~7~~ 8)	*see* 6.5

NOTES
1. Leak or hydropneumatic testing may be accepted, provided that at least one tank of each type is structurally tested, to be selected in connection with the approval of the design, *see* 6.7.
2. When hose testing cannot be performed without damaging possible outfittings already installed, it may be replaced by a careful visual inspection of all the crossings and welded joints. Where necessary, dye penetrant test or ultrasonic leak test may be required.
3. Where applicable testing of the aft peak is to be carried out after the stern tube has been fitted.
4. The highest point of the tank is generally to exclude hatchways.
5. If leak or hydropneumatic testing is carried out, arrangements are to be made to ensure that no pressure in excess of 0,30 bar (0,30 kgf/cm^2) can be applied.
6. ~~If a flooding arrangement is used the structure is to be tested using the maximum head that could be experienced for which elastic design criteria were used.~~ Watertight doors and hatches to be supplied with a test certificate stating the maximum pressure head for which they are suitable. For large watertight closing appliances that cannot be tested *see* Pt 4, Ch 3,3.4 or 4.3.
7. *See also* SOLAS Reg. II-1/18. Where the door has had the full hydrostatic test before installation, the hose test may be replaced by careful visual examination after full operational tests.

~~7~~ 8. If the magazine is required to contain an overpressure, for example due to a fire, the testing requirements are to be specified by the Naval Authority.

Volume 3, Part 1, Chapter 6
Manoeuvring Assessment

Effective date 1 January 2010

■ *Section 1*
General

1.1 Application

1.1.1 The requirements contained in these Rules apply to naval ships of all rudder and propulsion types, where the length between perpendiculars, L_{pp}, is 50 m and over. Special consideration may be given to applying these requirements to smaller vessels.

1.1.3 Where a ship's manoeuvring capability is assessed and verified in accordance with these Rules, it will be eligible for the class notations specified in 1.2.

1.1.4 For a ship under construction, the requirements of Sections 2 ~~and~~ or 3 are to be met as applicable.

1.1.5 For an existing ship, all available data and full-scale manoeuvring information are to be submitted. This information will be examined against the requirements of these Rules and, if acceptable, the scope of the representative manoeuvres required in ~~Section 3~~ Section 4 may be reduced.

1.1.6 Where the **LMA** notation is applied these ~~These~~ Rules satisfy the requirements of IMO Resolutions A.601(15), *Provision and Display of Manoeuvring Information On Board Ships* and ~~A.751(18), *Interim Standards for Ship Manoeuvrability*~~ *MSC.137(76), Standards for Ship Manoeuvrability*.

1.2 Class notations

1.2.1 In addition to the hull and machinery class notations defined in Vol 1, Pt 1, Ch 2,3, ships complying with these requirements will be eligible to be assigned the notations: ~~Lloyd's Manoeuvring Assessment notation **LMA.**~~

LMA Lloyd's Manoeuvring Assessment, *see* Section 2.
LNMA Lloyd's Naval Manoeuvring Assessment, *see* Section 3.

1.3 Information and plans to be submitted

(*Part only shown*)
1.3.2 Information required for assessment:
(a) Ship data, where applicable, *see* Vol 1, Pt 3, Ch 1,5 of the Rules for Naval Ships:
- Length overall.
- Length between perpendiculars (L_{pp}).
- Moulded breadth.
- Draught at forward perpendicular.
- Draught at after perpendicular.
- Block coefficient and/or primstaic coefficient.
- Midship or maximum section area coefficient.
- Waterplane area coefficient.
- Distance of LCG from amidships (positive fwd).
- Height of VCG above baseline.
- Cross-sectional area of bulbous bow, if applicable, at the forward perpendicular below the load waterline.
- Wetted area of appendages, excluding rudder and propeller.
- Transverse metacentric height above baseline.
- Extreme height of the ship structure above baseline.

(h) Ship performance data:
- Ship design speed.
- Propeller RPM at ship design speed.
- Power and percentage MCR to which ship speed and RPM apply.
- Draught conditions applicable to powering condition.
- Range of operating draughts and trims.
- Sea-state applicable to powering condition.
- RPM margin on propeller in the case of a new ship.

1.4 Sister ships

1.4.4 For a sister ship to a ship carrying the **LMA** notation, the ~~A sister~~ ship will be required to carry out the following representative manoeuvres, in accordance with ~~3.1.2~~ Section 4:
(a) A ship's stopping manoeuvre from full sea speed achieved by the application of full astern thrust.
(b) A 10°/10° zig-zag manoeuvre under the approach conditions defined in ~~3.4~~ 4.4.
(c) A 20°/20° zig-zag manoeuvre under the approach conditions defined in ~~3.4~~ 4.4.
(d) An initial turning trial under the approach conditions defined in ~~3.4~~ 4.4.

1.4.5 For a sister ship to a ship carrying the **LNMA** the ship will be required to verify performance at sea trials. The manoeuvres to be conducted are to be agreed between LR and the Naval Administration.

■ *Section 2*
Assessment for LMA notation

2.3 Manoeuvring standards

2.3.1 For the assignment of the **LMA** notation, the ship is to be assessed in accordance with the requirements of IMO Resolution ~~A.751(18)~~ MSC.137(76).

■ *Section 3*
Assessment for LNMA notation

3.1 General

3.1.1 For the assignment of the **LNMA** notation, model tests are to be carried out and supported by calculations, using the information specified in 1.3, to predict the ship's manoeuvring capability which must satisfy the requirements of 3.2. The predicted performance against the requirements of 3.2 will be verified during sea trials

3.1.2 The calculations will normally be carried out by Lloyd's Register (hereinafter referred to as 'LR'), but may be carried out by the designer or Shipbuilder and submitted to LR for assessment together with the data specified in 1.3.

3.1.3 The model tests are to be carried out by a suitable organisation recognised by LR and the Naval Administration and a report is to be submitted to LR detailing the test arrangements, schedule of tests and results presented in both diagrammatic and tabular form.

3.2 Manoeuvring performance criteria

3.2.1 **Turning ability**, *see* 5.4 and Table 6.2.1. The advance is to not exceed C1 ship lengths (*L*) and the tactical diameter should not exceed C2 ship lengths in the turning circle manoeuvre.

3.2.2 **Initial turning ability**, *see* 5.8 and Table 6.2.1. During the 10°/10° zig-zag manoeuvre with an application of 10° rudder angle to port/starboard the ship is not to have travelled more than C3 ship lengths by the time the heading has changed by 10° from the original heading.

3.2.3 **Yaw checking and course-keeping abilities**, *see* 5.7 and Table 6.2.1. The values of the first overshoot angles during 20°/20° zig-zag manoeuvres are not to exceed 20°. The values of the first and second overshoot angles during 10°/10° zig-zag manoeuvres are not to exceed:

L/V (seconds)	First overshoot angle (degrees)	Second overshoot angle (degrees)
<10	10	25
10 ≤ *L/V* ≤ 30	5 + 0,5(*L/V*)	17,5 + 0,75(*L/V*)
>30	20	40

3.2.4 **Stopping ability,** *see* 5.6 and Table 6.2.1. The track reach in the crash stop manoeuvre should not exceed C4 ship lengths.

3.2.5 **Course keeping ability**, *see* 5.5 and Table 6.2.1. The residual rate of turn after a pull-out manoeuvre should not exceed C5 per cent of that recorded for the preceding steady turn.

3.2.6 **Self berthing**, *see* Table 6.2.1, optional as required by the Naval Administration. The vessel shall be capable of moving transversely at a speed of C6 knots with zero rate of rotation.

3.2.7 **Acceleration ability**, *see* 5.12 and Table 6.2.1, optional as required by the Naval Administration. The time to accelerate to maximum ahead speed shall not exceed C7 seconds.

3.2.8 **Rate of turn**, *see* Table 6.2.1, optional as required by the Naval Administration. The rate of turn during the period between the initiation of the manoeuvre and the point which is reached in 5.4.3(b) is not to be less than C8 degrees per second per knot, based on speed of entry into turn.

3.2.9 **Turning from rest**, *see* 5.13 and Table 6.2.1, optional as required by the Naval Administration. This requirement relates to NS3 ships, specifically ships directly engaged in mine clearance. The time from order execute to a 90° change of heading while accelerating from rest is not to exceed C9 seconds.

Table 6.2.1 Recommended manoeuvring criteria

Criteria	Applicable ship types		
	NSA	NS1, 2 and 3[1]	NS3[2]
C1	4,5	4,0	4,0
C2	4,5	4,0	2,0[3] or 4,5[4]
C3	2,5	1,8	1,5
C4	10	5[5]	2
C5	5	5	5
C6	1,5[6]	1,5[6]	1,5[6]
C7	n/a	150	150
C8	n/a	0,15–*L*/2500	0,15–*L*/2500
C9	n/a	n/a	100

NOTES
1. Excluding ships directly engaged in mine clearance.
2. For ships directly engaged in mine clearance.
3. Rate applicable for ships engaged in mine hunting.
4. Rate applicable for engaged in minesweeping.
5. Where the displacement of the ship exceeds 10,000 tonnes, this criteria may be relaxed with the agreement of the Naval Authority.

3.3 Wheelhouse poster and manoeuvring booklet

3.3.1 The results of the calculations or model tests required by 3.1 (stating the assumptions made), together with additional information gained from the verification trials, and trial data for the man overboard manoeuvre, are to be presented in diagrammatic and tabular form and included in a wheelhouse poster and a manoeuvring booklet.

3.3.2 The poster is to be permanently displayed in the wheelhouse, and is to contain a clear warning that the data presented is applicable to calm weather with no wind, waves or current. The booklet is to be placed on board and is to contain comprehensive details of the ship's manoeuvring characteristics.

3.3.3 The format, data and content of the wheelhouse poster and the manoeuvring booklet are to meet the requirements of the Naval Administration.

3.4 Manoeuvring information card

3.4.1 The manoeuvring information card or bridge card is to contain a summary of the ship's manoeuvring capabilities and principal particulars and is to be kept on the wheelhouse for the information of the pilot.

3.4.2 The format and data to be presented on this card are to satisfy the requirements of the Naval Administration.

■ ~~*Section 3*~~ *Section 4* Verification trials

~~3.1~~ 4.1 General

~~*3.1.1*~~ *4.1.1* For the assignment of the **LMA** or **LNMA** notation, representative manoeuvres are to be carried out during sea trials, in accordance with the guidelines in ~~Section 4~~ Section 5, to verify estimates derived in Section 2 or 3 as applicable.

~~*3.1.2*~~ *4.1.2* Verification trials are normally to be performed with a clean hull and propeller in the presence, and to the satisfaction, of the LR Surveyor.

~~*3.1.3*~~ *4.1.3* A report is to be submitted to LR detailing the test schedule and presenting the results of each manoeuvring trial in accordance with the guidelines in ~~Section 4~~ Section 5.

~~3.2~~ 4.2 Environmental restrictions

~~3.2.1~~ *4.2.1* The verification trials are to take place in deep, unconfined waters, to minimise the interactive effects of the sea bed topography. ~~The water depth is not to be less than four times the mean operational draught of the ship. The windspeed should not exceed Beaufort 5 and wave sea state 4 should not be exceeded. Heavy swell is to be avoided.~~ The environmental conditions are to be as follows:

LMA notation:

- The water depth is not to be less than four times the mean operational draught of the ship.
- The wind speed should not exceed Beaufort 5.
- The wave sea state should not exceed 4.

LNMA notation:

- The water depth is not to be less than 5 times the mean operational draught of the ship or 0,0747V2, whichever is greater.
- The wind speed should not exceed 15 knots.
- The wave sea state should not exceed 3.
- In both cases heavy swell is to be avoided.

~~3.2.2~~ *4.2.2* The environmental conditions (wind, significant wave height, current and swell) are to be accurately recorded throughout the duration of the trials. The results of the trials are to be corrected to indicate the ship's manoeuvring capability under zero wind, waves and current.

~~3.3~~ 4.3 Draught conditions

~~3.3.1~~ *4.3.1* The trials are normally to be carried out with the ship in a normal operational condition within a five per cent deviation of the design draught and trim.

~~3.3.2~~ *4.3.2* Where it is impractical to conduct trials at design draught, they may be conducted at a draught as close to the design draught as possible with minimum trim and sufficient propeller immersion.

~~3.3.3~~ *4.3.3* Where trials are conducted in a condition other than that required by ~~3.3.1~~ 4.3.1, the necessary manoeuvring characteristics are to be estimated for the trial and full load condition using an acceptable method, and the results are to be submitted to LR for assessment.

~~3.4~~ 4.4 Approach conditions

~~3.4.1~~ *4.4.1* The approach speed for the assessment under Section 2 (**LMA** notation) is to be at least 90 per cent of the ship's speed corresponding to 85 per cent of the maximum engine output.

4.4.2 The approach speed for the assessment under Section 3 (**LNMA** notation) is to be at least 100 per cent of the ship's speed unless otherwise specified by the Naval Administration.

~~3.4.2~~ *4.4.3* Before the execution of the relevant manoeuvre, the ship must have run at constant engine(s) setting with minimum rate of change of heading (steady course).

Existing sub-Section 3.5 *is to be renumbered* 4.5.

~~3.5~~ 4.5 Representative manoeuvres (LMA notation)

4.6 Representative manoeuvres (LNMA notation)

4.6.1 Specific manoeuvres are to be carried out to an agreed trials code. The scope of the manoeuvres is to be agreed between LR, the Designer/Builder and the Naval Administration.

■ ~~Section 4~~ *Section 5*
Guidelines on conducting ship verification trials

Existing Section 4 *is to be renumbered* Section 5.

~~4.1~~ 5.1 General

~~4.1.4~~ *5.1.4* The following points are to be noted when determining the trials agenda:

- The ship's dynamic stability is required to be assessed in accordance with ~~3.5.2~~ 4.5.2. It is recommended that the pull-out manoeuvre is performed at the end of the turning circle manoeuvres, *see* ~~4.5~~ 5.5.
- The initial turning ability of the ship, required by 2.2.1(d), can be measured during the 10°/10° zig-zag manoeuvring trial, *see* ~~4.7~~ 5.7.

~~4.2~~ 5.2 Calibration of the data logging and measurement system

~~4.2.1~~ *5.2.1* Before commencing the verification trials, the data logging and measurement system is to be calibrated. The allowable measurement tolerances and the frequency of each measurement are given in Table ~~6.4.1~~ 6.5.1.

~~4.3~~ 5.3 Data recording

~~4.3.1~~ *5.3.1* The data describing manoeuvring performance is to be measured and recorded in accordance with the requirements of ~~Table 6.4.1~~ Table 6.5.1. This data is to be measured and recorded from the start of the approach run and terminated at the end of the manoeuvring trial. The start of the manoeuvring trial is to be defined by a specific engine order or helm change noted on the recorded measurements.

~~4.4~~ 5.4 Turning circle manoeuvring trials

~~4.4.2~~ *5.4.2* The turning circle manoeuvre is to be conducted as follows:

(a) It is to be initiated when:
  (i) the relative approach condition defined in ~~3.5.1(a)~~ 4.4 is satisfied and the ship is running head to wind; and
  (ii) the rudder is ordered hard over to port or starboard.

(b) It must continue without any alteration to the engine control settings.

(c) It is to be terminated when the ship has completed a 540° turn.

Table ~~6.4.1~~ 6.5.1 Data measurement and accuracy requirements

Parameter	Turning circles	Pull-out manoeuvres	Stopping/ Acceleration manoeuvres	Zig-zag manoeuvres	Spiral manoeuvres	Turning from rest manoeuvres	Man overboard manoeuvres	Minimum accuracy
Time	Continuously	Continuously	Continuously	Continuously	Continuously	Continuously	Continuously	± 1 sec
Position	Initially, and then at least every 45 degree change of heading		Initially, and then at least every 20 secs	At least 5 equally spaced measurements			Initially, then at least every 45 degree change of heading or 20 secs which-ever is the lesser	± 10 metres
Forward speed	At least every 10 secs or 30 degree change of heading		At least every 5 secs	At least every 5 secs	Initially, then once at each steady rate of turn		At least every 5 secs	± 0,5 knots
Heading	At least every 5 secs	At least every 2 secs	At least every 20 secs	At least every 2 secs	At least every 2 secs	At least every 2 secs	At least every 2 secs	± 0,5 degrees
Rudder angle	Initially, and then at least every 45 degree change of heading	At least every 2 secs	Initially, and then periodically to check the rudder is amidships	At least every 2 secs	One for each steady rate of turn	Initially, and then periodically to check the rudder is hard over	At least every 5 secs	± 1 degree
Engine RPM	Initially, and then at least every 45 degree change of heading		Initially, and then at least every 5 secs	Initially, and then at least at every crossing of the the base course	Initially, and then once at each steady rate of turn		Initially, then when the rudder is reversed and at the end of the manoeuvre	± 1% of initial setting
Rate of turn	At least every 5 secs	At least every 2 secs		At least every 5 secs	At least every 5 secs	At least every 2 secs		± 0,05 degrees/ sec

NOTE
All parameters are to be measured at the initiation and termination points of each manoeuvring trial.

~~*4.4.3*~~ *5.4.3* The following information is to be derived from the trials data, *see* ~~Fig. 6.4.1~~ Fig. 6.5.1:

(a) Time taken to reach each 90º change of heading.
(b) Advance at each 90º change of heading.
(c) Transfer at each 90º change of heading.
(d) Tactical diameter.
(e) Steady turning diameter.
(f) Loss in forward speed during the turn.
(g) Rate of turn during the turn, *r*, *see* ~~4.9.5~~ 5.9.5(c).

Fig. ~~6.4.1~~ 6.5.1
Presentation of turning circle manoeuvring trial results

Fig. ~~6.4.2~~ 6.5.2
Presentation of pull-out manoeuvring trial results

~~4.5~~ 5.5 Pull-out manoeuvring trials

~~*4.5.1*~~ *5.5.1* The pull-out manoeuvre is a simple trial which has been developed to give a quick indication of the ship's dynamic stability and course keeping ability. The pull-out manoeuvre is to be performed at the end of each turning circle manoeuvring trial. The results of these manoeuvres will indicate whether a spiral manoeuvre trial is required to be conducted, *see* ~~4.9~~ 5.9.

~~*4.5.2*~~ *5.5.2* The pull-out manoeuvre is to be conducted as follows:

(a) The ship is to be in a steady state turn (constant rate of turn) with the rudder hard over. This manoeuvre is normally conducted on the termination of the turning circle manoeuvring trial.
(b) This manoeuvre is initiated when the rudder is ordered amidships.
(c) With the rudder held amidships, the rate of turn will decrease.
(d) If the ship possesses 'dynamic stability', the rate of turn will reduce towards zero with equal residual rates of turn for both port and starboard turns with the rudder held amidships. If there is an unequal residual rate of turn with the rudder held amidships, then the ship is to be considered 'dynamically unstable', *see* ~~Fig. 6.4.2~~ Fig. 6.5.2.

~~*4.5.3*~~ *5.5.3* The following information is to be derived from the trials data, and presented as shown in ~~Fig. 6.4.2~~ Fig. 6.5.2:

A plot of the time histories of the ship's head, rate of turn and ship's speed.

~~4.6~~ 5.6 Stopping trials

~~4.6.2~~ *5.6.2* The stopping manoeuvre is to be conducted as follows:

(a) It is to be initiated when:
  (i) the relative approach conditions defined in ~~3.5.1(b) or (c)~~ 4.4 are satisfied and the ship is running with the wind astern, and
  (ii) the demand for full astern power or stop is given from the engine control position on the bridge.
(b) The rudder is to be used to a minimal extent and only to keep the ship on course for as long as possible.
(c) It is to be terminated when the ship has stopped dead in the water.

~~4.6.3~~ *5.6.3* The following information is to be derived from the trials data, *see* ~~Fig. 6.4.3~~ Fig. 6.5.3:

(a) Minimum speed at which course can be maintained.
(b) Head and track reach.
(c) Lateral deviation and final heading.
(d) Time to stop dead in the water.

Fig. ~~6.4.3~~ 6.5.3
Presentation of both stopping trials' results

~~4.7~~ 5.7 Zig-zag manoeuvring trials

~~4.7.2~~ *5.7.2* The zig-zag manoeuvre involves the cyclic movement of the ship about an initial base course. The zig-zag manoeuvre is conducted as follows:

(a) It is to be initiated when:
  (i) the approach conditions defined in ~~3.5.1(e) or (f)~~ 4.4 have been satisfied and the ship is running head to wind; and
  (ii) the rudder is ordered to θ_2 degrees to starboard (or port).
(b) It must continue without any alteration to the engine control settings.
(c) When the heading has changed by θ_2 degrees from the original course, the rudder is to be ordered to the opposite angle θ_1 degrees to port (or starboard).
(d) When the heading has changed by θ_1 degrees from the original course, the rudder is to be ordered to the opposite angle θ_2 degrees to starboard (or port).
(e) This manoeuvre is to be terminated when the ship's head has crossed the base course at least three times.

~~4.7.3~~ *5.7.3* The following information is to be derived from the trials data, *see* ~~Fig. 6.4.4~~ Fig. 6.5.4:

(a) A plot of the time histories of the rudder angles and corresponding ship's heading.
(b) First overshoot angle.
(c) Second overshoot angle.
(d) Time to check yaw (rate of change of heading equals zero) at each rudder reversal.
(e) Initial turning time.

Fig. ~~6.4.4~~ 6.5.4
Presentation of zig-zag manoeuvring trial results

~~4.8~~ 5.8 Initial turning manoeuvring trials

~~4.8.1~~ *5.8.1* The initial turning manoeuvring trial measures the transient effectiveness of the rudder(s). To ascertain the ship's initial turning ability, in accordance with ~~2.2.1(d) and 3.5.1(g)~~ 4.4, the following data is to be recorded from the 10º/10º zig-zag manoeuvring trials:

When the ship's head has moved 10º off the base course, after the initial rudder command, the number of ship lengths travelled is to be recorded.

~~4.9~~ 5.9 Spiral manoeuvring trials

~~4.9.2~~ *5.9.2* There are two possible variations of the manoeuvring trials that can be used to assess the ship's dynamic stability, namely:

The direct, or Dieudonne, spiral manoeuvre.
The reverse, or Bech, spiral manoeuvre.

~~4.9.4~~ *5.9.4* The direct spiral manoeuvre is to be conducted as follows:

(a) It is to be initiated when:
  (i) the approach conditions defined in ~~3.4~~ 4.4 have beensatisfied, and
  (ii) the rudder is ordered to 25º to starboard.
(b) It must continue without any alteration to the engine control settings.
(c) The rudder is to be held until the indicated rate of turn is assumed constant.
(d) The rudder angle is then to be decreased by 5º and held until the rate of turn is assumed constant.
(e) The manoeuvre is to be terminated when the rudder has moved through the range of 25º to starboard to 25º to port and then back to 25º to starboard in incremental rudder angles of 5º.
(f) For dynamically unstable ships, the incremental rudder angle in the range of 10º to starboard through to 10º to port is to be 2º.

~~4.9.5~~ *5.9.5* The reverse spiral manoeuvre is to be conducted as follows:

(a) It is to be initiated when:
  (i) the approach conditions defined in ~~3.4~~ 4.4 have been satisfied; and
  (ii) the first constant rate of change of heading is achieved.
(b) It must continue without any alteration to the engine control settings.
(c) The recommended constant rates of turn are defined as percentages of the steady state rate of turn, *r*, derived from the turning circle, as shown in ~~Table 6.4.2.~~ Table 6.5.2. For the **LNMA** notation the Naval Administration may advise on the requirements for constant rates of turn.
(d) The points P1 to P8 represent positions on the spiral curve, *see* ~~Fig. 6.4.5~~ Fig. 6.5.5.
(e) The first and last points on the spiral curves (P1 and P8) can be derived from the turning circle manoeuvres.
(f) The ship is to be steered at a constant rate of turn and the mean rudder angle to achieve the desired rate of turn is to be noted. The rudder angle deviations are not to be greater than ±2º.
(g) The manoeuvre is to be terminated when all points have been determined.

Table ~~6.4.2~~ 6.5.2
Recommended constant rate of change of heading

~~*4.9.6*~~ *5.9.6* The following information is to be derived from the trials data, *see* ~~Fig. 6.4.5~~ Fig. 6.5.5:

(a) A time history of the rudder angle and corresponding rate of turn.
(b) A plot of the constant rate of turn as an ordinate against the applied rudder angle.

Fig. ~~6.4.5~~ 6.5.5
Presentation of spiral manoeuvring trial results for a dynamically unstable ship

Fig. ~~6.4.6~~ 6.5.6
Presentation of the Williamson turn, man overboard, manoeuvring trial results

~~4.10~~ 5.10 Man overboard manoeuvring trials

~~*4.10.2*~~ *5.10.2* The elliptical turning manoeuvre is to be conducted as follows:

(a) It is to be initiated when:
  (i) the approach conditions defined in ~~3.4~~ 4.4 have been satisfied, and
  (ii) the rudder is ordered hard over.
(b) It must continue without any alteration to the engine control settings.
(c) The rudder is to remain hard over until the ship has altered course by 180º. The ship is to be steadied on the reciprocal heading until the approach speed has been regained.
(d) The rudder is once again placed hard over and the ship is steadied on the original course.
(e) This manoeuvre is to be terminated when the ship has returned to the position, or nearest position, where the manoeuvre was initiated.

~~*4.10.3*~~ *5.10.3* The Williamson turning manoeuvre is considered quicker than the elliptical turning manoeuvre in returning the ship to the original man overboard position. This manoeuvre is to be conducted as follows:

(a) It is to be initiated when:
  (i) the approach conditions defined in ~~3.4~~ 4.4 have been satisfied, and
  (ii) the rudder is ordered hard over.
(b) It must continue without any alteration to the engine control settings.
(c) The rudder is to remain hard over until the ship has altered course by 70º. The rudder is then ordered hard over to the opposite side, until the ship is on a course which is the reciprocal of the original approach course.
(d) It is terminated when the ship has returned to the position, or nearest position, where the manoeuvre was initiated.

~~*4.10.4*~~ *5.10.4* The following information is to be derived from the trials data, *see* ~~Fig. 6.4.6~~ Fig. 6.5.6:

(a) A plot of the ship's track.
(b) The time taken to return to the point, or nearest position to that point, at which the manoeuvre was initiated.
(c) The lateral deviation from the initial course at the point, or nearest position to that point, at which the manoeuvre was initiated.

~~4.11~~ 5.11 Manoeuvring trials for auxiliary thrusters

~~*4.11.1*~~ *5.11.1* Where a ship is fitted with auxiliary thrusters, such as bow thrusters, a turning circle manoeuvre is required to be performed ~~in accordance with 3.5.1(j)~~ to determine the effectiveness of those thrusters in turning the ship through 180º. This trial is to be carried out with the wind initially from the stern and the ship turning into the wind.

~~*4.11.3*~~ *5.11.3* The following information is to be derived from the trials data:

(a) The time taken to reach a 90º change of heading.
(b) The time taken to reach a 180º change of heading.
(c) The transfer at a 90º change of heading, *see* ~~Fig. 6.4.1~~ Fig. 6.5.1.
(d) The transfer at a 180º change of heading, *see* ~~Fig. 6.4.1~~ Fig. 6.5.1.
(e) The steady state rate of change of heading.

5.11.4 If required by 3.2.6 (**LNMA** notation only) a self berthing manoeuvre is to be carried out:

(a) The ship is to be positioned bow or stern to the wind.
(b) All primary thrusters stopped and the ship dead in the water.
(c) The auxiliary thrusters are to be set to maximum power for transverse motion.
(d) The manoeuvre may be terminated when the ship has recorded a steady transverse speed with zero rate of rotation.

5.11.5 The following information is to be derived from the trials data:

(a) The time taken to reach a steady transverse velocity.
(b) The maximum transverse velocity attained.
(c) The heading of the vessel at least every two seconds during the manoeuvre.

5.12 Acceleration trials

5.12.1 The acceleration trials information on the distance and time to achieve a speed defined by 80–100 per cent MCR set speeds from a dead stop.

5.12.2 The following trial procedure is to be followed as illustrated in Fig. 6.5.7:

(a) Establish a steady ship speed in accordance with the trial agenda and adjust the ship's heading to a steady course. At a position roughly one ship length before the point where the engine order is initiated, start the acquisition system.
(b) Execute the prescribed engine order.
(c) The rudder is to be used to a minimal extent and only to keep the ship on course.
(d) When the ship attains the steady terminal speed stated in the trial agenda, the test is complete.

5.12.3 The following information is to be derived from the trials data:

(a) The time taken to reach the terminal speed specified in the trials agenda.
(b) The distance covered from the time the engine order is initiated until the ship reaches the terminal speed specified in the trials agenda.
(c) Lateral deviation and final heading.

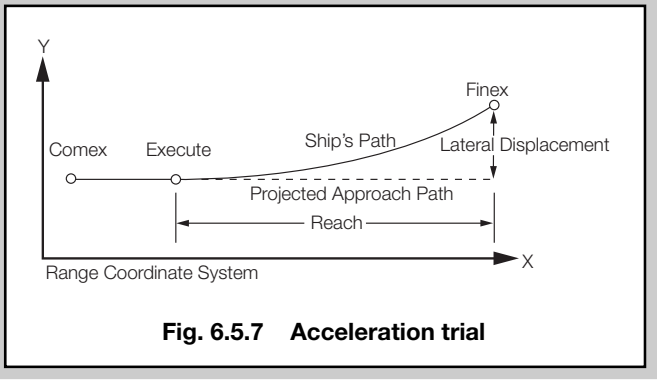

Fig. 6.5.7 Acceleration trial

5.13 Tuning from rest

5.13.1 The turning from rest manoeuvre is to be conducted as follows:

(a) All primary and auxiliary thrusters are stopped and the ship dead in the water;
(b) the rudder is ordered hard over;
(c) the demand for full ahead power is given from the engine control position on the bridge;
(d) the ship must continue without any alteration to the engine control settings;
(e) the rudder is to remain hard over until the ship has altered course by 90°;
(f) this manoeuvre is to be terminated when the ship has altered course by 90°.

5.13.2 The time taken from the full ahead order until the ship has altered course by 90° is to be recorded.

Volume 3, Part 3, Chapter 1
General Requirements

Effective date 1 January 2010

■ *Section 1*
Scope

1.1 Application

1.1.2 In general, a Class Notation contained in this Part of the Rules will only be assigned where the vessel has been assigned an **LMC** notation (*see* Vol. 1, Pt 1, Ch 2). However, where a Certificate of Compliance is sought it may be demonstrated that an equivalent provision of equipment and arrangements is provided on board the vessel. In addition, the equipment and arrangements are also to be in compliance with the applicable Sections of Volumes 1 and 2 of these Rules. Other acceptable standards such as Naval Defence Standards or *ANEP-77 NATO Naval Ship Code* (NSC) may be used subject to satisfactory review by LR.

1.2 Background

1.2.2 This Part of the Rules has been developed from the relevant requirements of:

- ~~*International Convention Safety of Life At Sea* which is in force on 1 July 2002 (SOLAS); and~~
- ~~*International Convention for the Prevention of Pollution from Ships 1973* (MARPOL) which is in force on 1 July 2002;~~
- *International Convention Safety of Life At Sea* (SOLAS); and
- *International Convention for the Prevention of Pollution from Ships 1973* (MARPOL); and
- *ANEP-77 NATO Naval Ship Code* (NSC).

taking due consideration of military philosophy.

1.4 Topics within this Part of the Rules

1.4.3 **ESC** – Escape and Emergency Access. This notation will be assigned to naval ships which demonstrate that the escape arrangements and emergency access on board comply with the requirements of Chapter 3 of this Part of the Rules. Where the requirements of the NSC are to be applied for an **ESC★★** notation, the **LSAE★★** notation must also be applied.

1.4.4 **LSAE** – Life Saving and Evacuation Arrangements. This notation will be assigned to naval ships which demonstrate that the life saving, evacuation and rescue arrangements on board comply with the requirements of Chapter 4 of this Part of the Rules. Where the requirements of the NSC are to be applied for an **LSAE★★** notation, the **ESC★★** notation must also be applied.

1.4.8 **Double Star Endorsements (★★)**. All Class Notations that are available in Chapters 2, 3 and 4 of this Part of the Rules will be eligible for a 'Double Star' endorsement where the arrangements on board are in accordance with stated National Administration requirements and *ANEP-77 NATO Naval Ship Code* (NSC). This does not necessarily denote automatic endorsement by the National Administration.

■ *Section 2*
General information

2.1 Responsibilities

2.1.4 The National Administration is responsible for confirming that the equipment and arrangements are acceptable to them for recognition of the requirements associated with a particular class notation with a double star (★★) endorsement, *see* 1.4.8.

Existing paragraphs 2.1.4 *and* 2.1.5 *are to be renumbered* 2.1.5 *and* 2.1.6.

2.2 Appraisal and review

2.2.3 All systems are to be constructed and assembled from equipment suitable for its intended purpose and acceptable to the Naval Authority and/or the National Administration where a 'Star' or 'Double Star' endorsement is required. Such equipment will typically have a relevant Type Approval Certificate or an EC Marine Equipment Directive Certificate issued by LR or an organisation acceptable to LR. Equipment with other certification may be acceptable as an alternative subject to a satisfactory review by LR. Details will be noted as an Annex in the applicable certification or class documentation, *see* 1.3.1.

Volume 3, Part 3, Chapter 2
Fire Protection

Effective date 1 January 2010

■ *Section 1*
Scope

1.2 Application

1.2.3 The 'Double Star endorsement' (★★) will be assigned to vessels where the arrangements onboard are in accordance with stated National Administration requirements and *ANEP-77 NATO Naval Ship Code* (NSC) – Chapter VI Fire Safety. This does not necessarily denote automatic endorsement by the National Administration.

■ *Section 2*
Classification requirements for fire protection systems

2.1 General requirements — SOLAS

2.1.1 The Fire Protection **FIRE** notation will be assigned to naval vessels which are shown to have levels of fire protection in accordance with Section 3 to 12 of these Rules.

2.2 General requirements - NSC

2.2.1 The Fire Protection **FIRE★★** notation will be assigned to vessels which can demonstrate that the levels of fire protection are in accordance with Chapter VI of the NSC.

2.2.2 Where the **FIRE★★** notation is to be assigned, an **LMC** notation must have been assigned, *see* Ch 1,1.1.2.

■ *Section 3*
Plans and particulars

3.1 Concept statement

3.1.1 The design intent of any fire protection system is to be submitted in the form of a Concept Statement and is to include but not limited to:

(a) The required class notation, **FIRE** ~~or~~, **FIRE★** or **FIRE★★**. If a military distinction (**MD**) notation is required this is also to be declared, *see* Vol 1, Pt 1, Ch 2,3.7.
(b) A Concept of Operations which is a description of the ship's designed operational role and capabilities and is to include any defined military survivability requirements.
(c) Details of the intended mode of operation of the fire protection systems/equipment to include environmental conditions together with a description of any fire scenarios and their development and application in the design.
(d) Manning levels, drills, exercises and operator competencies/authorisations required.
(e) Indication of whether or not alternative design assessment is being sought, if the proposed design deviate from the specified guidance identified in these Rules.

The concept statement is to be agreed by the designer and Owner/Operator, *see also* Ch 1,2.3.2.

Volume 3, Part 3, Chapter 3
Escape and Emergency Access

Effective date 1 January 2010

■ *Section 1*
Scope

1.2 Application

1.2.3 The 'Double Star endorsement' (★★) will be assigned to vessels where the arrangements onboard are in accordance with stated National Administration requirements and *ANEP-77 NATO Naval Ship Code* (NSC) – Chapter VII Escape, Evacuation and Rescue. This does not necessarily denote automatic endorsement by the National Administration.

■ *Section 2*
Classification requirements for escape and emergency access

2.1 General requirements — SOLAS

2.1.1 The Escape and Emergency Access **ESC** notation will be assigned to vessels which can demonstrate that the levels of personnel safety in the event of a 'prepare to evacuate' scenario are in accordance with Sections 3 to 6 of these Rules.

2.2 General requirements – NSC

2.2.1 The Escape and Emergency Access **ESC★★** notation will be assigned to vessels which can demonstrate that the levels of personnel safety in the event of a 'prepare to evacuate' scenario are in accordance with Chapter VII of the NSC.

2.2.2 Where the **ESC★★** notation is to be assigned, a **LSAE** and an **LMC** notation must also have been assigned, *see* Ch 1,1.1.2.

■ *Section 3*
Plans and particulars

3.1 Concept statement

3.1.1 The design intent of any escape and emergency access arrangements is to be submitted in the form of a Concept Statement and is to include, but not be limited to;

(a) The required class notation, **ESC** ~~or~~, **ESC★** or **ESC★★**. If a military distinction (**MD**) notation is required this is also to be declared, *see* Vol 1, Pt 1, Ch 2,3.7.

(b) A Concept of Operations which is a description of the ship's operational capabilities and is to include any defined military survivability requirements.

3.2 Design disclosure

(*Part only shown*)

3.2.1 In addition to submission of an acceptable Concept Statement, a Design Disclosure is required for submission to and acceptance by Lloyd's Register (hereinafter referred to as 'LR'). The Design Disclosure is to include, but is not limited to:

(e) Evidence of compliance with the Objectives and Goals defined in Sections 5 to 12. This may be in the form of compliance with specified guidance/technical references, Concessions, Alternative Design Justification Reports or an acceptable combination of all three. *See also* Ch 1,2.3 and 6.
  (i) If applying for SOLAS, follow Sections 5 and 6;
  (ii) If applying for NSC, follow Section 6.

(f) Details of the Hazard Identification process and Class related hazards are to be submitted. A hazard identification system is to be in place at the design stage whereby all hazards identified are recorded. If application of these Rules has been identified as a hazard avoidance/mitigation measure, then details are to be submitted.

Volume 3, Part 3, Chapter 4
Life-Saving and Evacuation Arrangments

Effective date 1 January 2010

■ *Section 1*
Scope

1.1 Philosophy

1.1.3 In general, demonstration of adequate provision of life-saving and rescue equipment will be achieved through compliance with the relevant requirements of SOLAS Chapter III or *ANEP-77 NATO Naval Ship Code* (NSC). Where life-saving and rescue arrangements deviate from the requirements of SOLAS Chapter III , they are to be suitable to satisfy the life saving and rescue objectives and functional requirements of this Chapter.

1.2 Application

1.2.3 The 'Double Star endorsement' (★★) will be assigned to vessels where the arrangements onboard are in accordance with stated National Administration requirements and *ANEP-77 NATO Naval Ship Code* (NSC) – Chapter VII Escape, Evacuation and Rescue. This does not necessarily denote automatic endorsement by the National Administration.

■ *Section 2*
Requirements for life-saving and evacuation arrangements

2.1 General requirements – SOLAS

2.1.1 The Life-Saving and Evacuation Arrangements **LSAE** notation will be assigned to vessels which demonstrate that the provision of life-saving and rescue equipment on board are in accordance with Sections 3 to 8 of these Rules.

2.2 General requirements – NSC

2.2.1 The Life-Saving and Evacuation Arrangements **LSAE★★** notation will be assigned to vessels which can demonstrate that the levels of personnel safety in the event of a 'prepare to evacuate' scenario are in accordance with Chapter VII of the NSC.

2.2.2 Where the **LSAE★★** notation is to be assigned, an **ESC** and a **LMC** notation must also have been assigned, *see* Ch 1,1.1.2.

■ *Section 3*
Plans and particulars

3.1 Concept statement

(*Part only shown*)

3.1.1 The design intent of any life saving or rescue system is to be submitted in the form of a Concept Statement and is to include, but not be limited to:

(a) The required class notation, **LSAE** ~~or~~, **LSAE★** or **LSAE★★**. If a military distinction (**MD**) notation is required this is to be declared, *see* Vol 1, Pt 1, Ch 2,3.7.

3.3 Plans

3.3.4 For operational procedures, the following information:

(a) Details of the evacuation procedure, to include drills and training.

(b) An evacuation analysis in accordance with SOLAS Chapter II-2, Regulation 13,7.4 or NSC Chapter VII, Regulation 3 as applicable.

Cross-References

Section numbering in brackets reflects any Section renumbering necessitated by any of the Notices that update the current version of the Rules for Naval Ships.

Volume 1, Part 3, Chapter 2

3.2.11 *Reference* Pt 6, Ch 6,5.3 *now reads* Pt 6, Ch 6,5.5.
3.2.12 *Reference* Pt 6, Ch 6,5.3 *now reads* Pt 6, Ch 6,5.5.

Volume 1, Part 3, Chapter 3

3.11.4 *Reference* Pt 6, Ch 6,5.9 *now reads* Pt 6, Ch 6,5.11.

Volume 1, Part 3, Chapter 5

10.2.2 *Reference* Pt 6, Ch 2,4 *now reads* Pt 6, Ch 2,3.

Volume 1, Part 4, Chapter 1

5.3.2 *Reference* Pt 6, Ch 2,5 *now reads* Pt 6, Ch 2,4.

Volume 1, Part 4, Chapter 2

2.9.3 *Reference* Pt 6, Ch 2,6 *now reads* Pt 6, Ch 2,5 (twice).
9.1.4 *Reference* Pt 6, Ch 2,6 *now reads* Pt 6, Ch 2,5.

Volume 1, Part 4, Chapter 3

2.11.5 *Reference* 3.9.8 to 3.9.10 *now reads* 3.10.8 to 3.10.10.
3.4.1 ***(3.5.1)*** *Reference* 3.5 *now reads* 3.6.
3.4.2 *Reference* Pt 6, Ch 2,4 *now reads* Pt 6, Ch 2,3.
3.5.2 ***(3.6.2)*** *Reference* 3.5.1 *now reads* 3.6.1.
3.5.4 ***(3.6.4)*** *Reference* 3.5.2 *now reads* 3.6.2.
3.6.8 ***(3.7.8)*** *Reference* 3.5.1 *now reads* 3.6.1.
3.6.8 ***(3.7.8)*** *Reference* 3.4.1 *now reads* 3.5.1.
3.7.1 ***(3.8.1)*** *Reference* 3.5.1 *now reads* 3.6.1.
Reference 3.4.1 *now reads* 3.5.1.
3.8.2 ***(3.9.2)*** *Reference* 3.8.8 *now reads* 3.9.8.
Reference 3.8.9 *now reads* 3.9.9.
Reference 3.8.10 *now reads* 3.9.10.
3.8.3 ***(3.9.3)*** *Reference* 3.5.4 *now reads* 3.6.4.
Reference 3.5.2 *now reads* 3.6.2.
3.8.4 ***(3.9.4)*** *Reference* 3.4.1 *now reads* 3.5.1.
3.8.5 ***(3.9.5)*** *Reference* 3.5.2 *now reads* 3.6.2.
3.8.6 ***(3.9.6)*** *Reference* 3.5.2 *now reads* 3.6.2.
3.8.7 ***(3.9.7)*** *Reference* 3.8.5 *now reads* 3.9.5.
Reference 3.8.6 *now reads* 3.9.6.
3.8.9 ***(3.9.9)*** *Reference* 3.4.1 *now reads* 3.5.1.
3.8.10 ***(3.9.10)*** *Reference* 3.4.1 *now reads* 3.5.1.
3.8.11 ***(3.9.11)*** *Reference* 3.4.1 *now reads* 3.5.1.
4.1.1 *Reference* Pt 6, Ch 2,3 *now reads* Pt 6, Ch 2,5.
4.3.5 ***(4.4.5)*** *Reference* 4.3.4 *now reads* 4.4.4 (twice).
4.3.6 ***(4.4.6)*** *Reference* 4.3.4 *now reads* 4.4.4.
Reference 4.3.5 *now reads* 4.4.5.
4.3.9 ***(4.4.9)*** *Reference* 4.8.1 *now reads* 4.9.1.
4.9.6 ***(4.10.6)*** *Reference* 4.5.3 *now reads* 4.6.3.
4.9.7 ***(4.10.7)*** *Reference* 4.9.1 *now reads* 4.10.1.
5.3.5 *Reference* Pt 6, Ch 2,4 *now reads* Pt 6, Ch 2,3
5.6.2 *Reference* 3.5 *now reads* 3.6.

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4.1.2 *Reference* Pt 6, Ch 2,6 *now reads* Pt 6, Ch 2,5.

Volume 1, Part 6, Chapter 2

4.1.2 ***(3.1.2)*** *References* 4.3 to 4.6 *now reads* 3.3 to 3.6.
References 4.7 to 4.8 *now reads* 3.7 to 3.8.
References 4.9 and 4.10 *now reads* 3.9 and 3.10.
4.3.2 ***(3.3.2)*** *Reference* Table 2.4.2 *now reads* Table 2.3.2.
4.3.3 ***(3.3.3)*** *Reference* Table 2.4.2 *now reads* Table 2.3.2.
Reference 4.4 *now reads* 3.4.
4.3.4 ***(3.3.4)*** *Reference* Table 2.4.2 *now reads* Table 2.3.2.
4.3.5 ***(3.3.5)*** *Reference* Table 2.4.2 *now reads* Table 2.3.2 (twice).
4.3.6 ***(3.3.6)*** *Reference* 4.3.5 *now reads* 3.3.5.
Reference Table 2.4.2 *now reads* Table 2.3.2.
4.3.7 ***(3.3.7)*** *Reference* 4.5 *now reads* 3.5.
4.3.8 ***(3.3.8)*** *References* 4.3.1(c), (d) and (e) *now reads* 3.3.1(c), (d) and (e).
Reference 4.5.4 *now reads* 3.5.4.
Reference 4.3.5 *now reads* 3.3.5.
Reference 4.5 *now reads* 3.5.
4.4.1 ***(3.4.1)*** *Reference* Table 2.4.1 *now reads* Table 2.3,1.
4.4.2 ***(3.4.2)*** *Reference* Table 2.4.1 *now reads* Table 2.3,1.
Table 2.4.1 ***(Table 2.3.1)*** *Reference* 4.2.1 *now reads* 3.2.1 (3 times).
Table 2.4.2 ***(Table 2.3.2)*** *Reference* 4.3.4 *now reads* 3.3.4 (twice).
Reference 4.3.5 *now reads* 3.3.5 (4 times).
Table 2.4.3 ***(Table 2.3.3)*** *Reference* 4.2.1 *now reads* 3.2.1 (twice).
4.4.3 ***(3.4.3)*** *Reference* 4.4.1 *now reads* 3.4.1 (twice).
Reference 4.2.1 *now reads* 3.2.1.
4.5.2 ***(3.5.2)*** *Reference* 4.5.5 *now reads* 3.5.5.
Reference Table 2.4.3 *now reads* Table 2.3.3.
4.5.3 ***(3.5.3)*** *Reference* 4.5.4 *now reads* 3.5.4.
Reference Table 2.4.3 *now reads* Table 3.4.3.
4.5.4 ***(3.5.4)*** *Reference* 4.2.1 *now reads* 3.2.1.
4.5.5 ***(3.5.5)*** *Reference* 4.5.3 *now reads* 3.5.3.
4.6.1 ***(3.6.1)*** *Reference* 4.6.3 *now reads* 3.6.3.
4.6.2 ***(3.6.2)*** *Reference* 4.2.1 *now reads* 3.2.1.
Reference Fig. 2.4.1 *now reads* Fig. 2.3.1.

4.6.3 ***(3.6.3)*** *Reference* Table 2.4.1 *now reads* Table 2.3.1.
4.7.1 ***(3.7.1)*** *Reference* 4.7.2 *now reads* 3.7.2.
References 4.1.3 and 4.5 *now reads* 3.1.3 and 3.5.
4.7.2 ***(3.7.2)*** *Reference* Table 2.4.3 *now reads* Table 2.3.3.
4.7.3 ***(3.7.3)*** *Reference* 4.4.1 *now reads* 3.4.1.
4.8.1 ***(3.8.1)*** *Reference* Fig. 2.4.2 *now reads* Fig. 2.3.2.
4.8.2 ***(3.8.2)*** *Reference* 4.2.1 *now reads* 3.2.1.
Reference Fig. 2.4.2 *now reads* Fig. 2.3.2.
4.9.1 ***(3.9.1)*** *Reference* 4.7 *now reads* 3.7.
4.9.2 ***(3.9.2)*** *Reference* 4.2.1 *now reads* 3.2.1 (twice).
Reference Table 2.4.3 *now reads* Table 2.3.3 (twice).
Reference 4.7.2 *now reads* 3.7.2.
4.10.1 ***(3.10.1)*** *Reference* Table 2.4.2 *now reads* Table 2.3.2.
4.10.2 ***(3.10.2)*** *Reference* Table 2.4.1 *now reads* Table 2.3.1.
5.1.2 ***(4.1.2)*** *References* 5.3, 5.4 and 5.5 *now reads* 4.3, 4.4 and 4.5.
5.5.1 ***(4.5.1)*** *Reference* 5.3.1 *now reads* 4.3.1.
6.1.1 ***(5.1.1)*** *Reference* Section 5 *now reads* Section 4.
Reference 5.3.1 *now reads* 4.3.1.
Reference 5.4.1 *now reads* 4.4.1.
6.2.1 ***(5.2.1)*** *Reference* Fig. 2.6.1 *now reads* Fig. 2.5.1.
Reference Table 2.6.1 *now reads* Table 2.5.1.
6.2.2 ***(5.2.2)*** *Reference* Table 2.6.1 *now reads* Table 2.5.1.
6.3.1 ***(5.3.1)*** *Reference* Fig. 2.6.2 *now reads* Fig. 2.5.2.
6.3.1 ***(5.3.1)*** *Reference* Table 2.6.1 *now reads* Table 2.5.1.
6.3.2 ***(5.3.2)*** *Reference* Table 2.6.1 *now reads* Table 2.5.1.
6.4.1 ***(5.4.1)*** *Reference* Fig. 2.6.3 *now reads* Fig. 2.5.3.
Reference Table 2.6.1 *now reads* Table 2.5.1.
6.4.2 ***(5.4.2)*** *Reference* Table 2.6.1 *now reads* Table 2.5.1.
Fig. 2.4.3 ***(Fig. 2.3.3)*** *Reference* Table 2.4.2(c) *now reads* Table 2.3.2(c).

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3.3.2 *Reference* Ch 2,4 *now reads* Ch 2,3 (twice).
Table 3.3.6 *Reference* Ch 2,4 *now reads* Ch 2,3.
Table 3.3.9 *Reference* Ch 2,4 *now reads* Ch 2,3.
4.2.2 *Reference* Ch 2,4 *now reads* Ch 2,3 (twice).
5.8.2 *Reference* Ch 6,5.6 *now reads* Ch 6,5.8.
6.1.4 *Reference* Ch 6,5.3 *now reads* Ch 6,5.5.
6.1.5 *Reference* Ch 6,5.3 *now reads* Ch 6,5.5.
7.2.2 *Reference* Ch 2,4 *now reads* Ch 2,3.
7.3.1 *Reference* Ch 2,4 *now reads* Ch 2,3.
8.2.2 *Reference* Ch 2,4 *now reads* Ch 2,3.
8.3.1 *Reference* Ch 2,4 *now reads* Ch 2,3.
9.1.3 *Reference* Ch 2,4 *now reads* Ch 2,3.
9.1.4 *Reference* Ch 2,4 *now reads* Ch 2,3.
9.2.1 *Reference* Ch 2,3 *now reads* Ch 6,5.

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2.6.1 *Reference* Ch 2,4 *now reads* Ch 2,3.
2.6.2 *Reference* Ch 2,4 *now reads* Ch 2,3.
Reference Ch 2,4.3 *now reads* Ch 2,3.3.
Reference Ch 2,4.6 *now reads* Ch 2,3.6.
3.3.4(b) *Reference* Ch 2,4.8 *now reads* Ch 2,3.8.
3.3.4(c) *Reference* Ch 2,4.9 *now reads* Ch 2,3.9.
3.4.3(a) *Reference* Ch 2,4.3 *now reads* Ch 2,3.3.
3.5.3(a) *Reference* Ch 2,4.3 *now reads* Ch 2,3.3.
4.4.4(a) *Reference* Ch 2,4.7 *now reads* Ch 2,3.7.
4.4.4(b) *Reference* Ch 2,4.8 *now reads* Ch 2,3.8.
4.4.4(c) *Reference* Ch 2,4.9 *now reads* Ch 2,3.9.
4.5.3(b) *Reference* Ch 2,4.6 *now reads* Ch 2,3.6.

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3.1.2 *Reference* Ch 2,4 *now reads* Ch 2,3.
Table 5.3.2 *Reference* Ch 2,4 *now reads* Ch 2,3.

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5.3.4 ***(5.5.4)*** *Reference* 5.3.12 *now reads* 5.5.12.
5.3.11 ***(5.5.11)*** *Reference* 5.3.10 *now reads* 5.5.10.
5.4.1 ***(5.6.1)*** *Reference* 5.3.4 *now reads* 5.5.4.
6.4.11 *Reference* 5.5 *now reads* 5.7.

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4.2.4 *Reference* Pt 6, Ch 2,4 *now reads* Pt 6, Ch 2,3.
Table 3.4.1 *Reference* Pt 6, Ch 2,4.3 *now reads* Pt 6, Ch 2,3.3 (3 times).
Table 3.4.2 *Reference* Pt 6, Ch 2,4.7 *now reads* Pt 6, Ch 2,3.7 (twice).
Table 3.4.3 *Reference* Ch 2,4.6 *now reads* Ch 2,3.6.
Reference Pt 6, Ch 2,4.8 *now reads* Pt 6, Ch 2,3.8.
Table 3.4.4 *Reference* Pt 6, Ch 2,4.3 *now reads* Pt 6, Ch 2,3.3 (twice).
Reference Pt 6, Ch 2,4.7 *now reads* Pt 6, Ch 2,3.7.
Reference Ch 2,4.9 *now reads* Ch 2,3.9.

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2.2.1 *Reference* 3.4.1 *now reads* 4.4.1 (4 times).
2.2.1(a) *Reference* 3.4.1 *now reads* 4.4.1.
2.2.1(e) *Reference* 3.5.2 *now reads* 4.5.2.
3.5.1 ***(4.5.1)*** *Reference* 3.4 *now reads* 4.4 (5 times).
3.5.2 ***(4.5.2)*** *Reference* 3.4.1 *now reads* 4.4.1.

Published by Lloyd's Register
Registered office
71 Fenchurch Street, London, EC3M 4BS
United Kingdom